E-Rickshaws in Climate Change Mitigation

A STUDY OF NCT DELHI

Coordinator : **Rajendra Ravi**

Research and Writeup : **Priyansh Maurya**

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Published by

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April 2026

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Published by :
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Acknowledgements

This report is the outcome of sustained fieldwork, careful analysis, and the generous cooperation of many individuals and institutions, without whom this study would not have been possible.

First and foremost, I extend my deepest gratitude to the e-rickshaw drivers of Delhi who participated in this research. Their willingness to share personal experiences, economic challenges, and everyday struggles formed the foundation of this study. Despite demanding working hours and uncertain livelihoods, they generously gave their time and insights, allowing this report to reflect their lived realities. This research is dedicated to their resilience and contribution to Delhi's urban mobility system.

I am sincerely thankful to Raj kumar and Mahendra Prasad of South Delhi E-Rickshaw Association, Harkesh Nagar, Savitribai Phule Community Centre, Bawana for organizing focus group discussion at Bawana, Delhi, parking operators, and informal mechanics who facilitated field access and provided critical perspectives on the functioning of the e-rickshaw ecosystem beyond driving alone. Their cooperation helped in understanding the structural and infrastructural dimensions of electric mobility at the ground level.

I would like to acknowledge the guidance, encouragement, and intellectual support received from the PARISAR Team and PRC, during the course of this research. Their feedback and discussions helped shape the analytical framework, particularly in linking electric mobility with informality, labour precarity, and Just Transition perspectives.

I am also grateful to institutions, researchers, and organisations whose existing literature, policy documents, and data informed this study. The insights drawn from work on informal labour, urban mobility, climate justice, and electric vehicle policy provided a strong conceptual foundation for the analysis.

Finally, I acknowledge the support of Harshit, Mamta, Nanhu Prasad, Nikhil, Radheshaym Choudhry, Rajendra Ravi, Ranjit Gadgil, Vipin and my friends, whose patience and encouragement made the completion of this report possible. Their unwavering support during fieldwork and writing phases was invaluable.

Any errors or omissions that remain are solely the responsibility of the author.

Foreword

Urban mobility discourse in India has long been shaped by an emphasis on large-scale, capital-intensive infrastructures—metros, highways, and app-based aggregators—often at the expense of the everyday transport modes that quietly sustain the pulse of city life. Among these, the rickshaw—first in its cycle-based form and now as an electric variant—has played a vital yet insufficiently acknowledged role in providing affordable, flexible, and last-mile connectivity. The transition from cycle rickshaws to e-rickshaws, however, has not been matched by a corresponding evolution in policy, technological innovation, or institutional support. Instead, it reveals a trajectory marked by neglect, informality, and piecemeal interventions.

Cycle rickshaws emerged as a cornerstone of urban transport in twentieth-century India, particularly within dense city fabrics where short-distance travel was essential. They offered livelihoods to a vast workforce—often migrants and economically marginalized communities—while delivering low-cost, non-motorized mobility to millions. Yet despite their significance, the sector remained structurally informal, defined by ambiguous legal standing, exploitative ownership patterns, and a near absence of welfare safeguards. Technological progress within this ecosystem was minimal; vehicle design, ergonomics, and efficiency saw little systematic improvement over decades. Consequently, the physical burden of mobility fell heavily on the pullers, raising enduring concerns about dignity, health, and equity.

The gradual decline—and in many cases, deliberate phasing out—of cycle rickshaws across cities was driven by urban modernization agendas, evolving regulatory frameworks, and the persistent stigmatization of non-motorized transport as backward. This transition, however, was neither uniform nor thoughtfully managed. Policies frequently prioritized removal over rehabilitation, leaving workers to navigate precarious livelihood shifts with limited institutional support. The absence of a coherent transition framework reflects a broader pattern in urban governance: the marginalization of informal, labour-intensive transport systems in favor of more visible, capital-driven alternatives.

The emergence of e-rickshaws over the past decade has been widely framed as a technological leap—cleaner, more efficient, and less physically taxing than their predecessors. Indeed, their rapid proliferation across cities and small towns underscores their importance in last-mile connectivity. Yet beneath this apparent progress lies a striking continuity of structural challenges. The sector continues to operate within a fragmented regulatory landscape, characterized by inconsistencies in licensing, financing, and enforcement. Meanwhile, innovation—whether in vehicle design, battery systems, safety standards, or integration with formal transport networks—remains uneven and limited.

Crucially, the shift from cycle to electric rickshaws has been largely market-driven rather than policy-led, resulting in what may be described as “informal electrification,”

where technological adoption outpaces institutional readiness. While electric mobility is often celebrated within broader sustainability narratives, the lived realities of e-rickshaw operators tell a more complex story—one marked by debt-financed ownership, unstable incomes, and persistent infrastructural gaps, including inadequate charging facilities and heightened road safety risks. Rather than a clean rupture from the past, this transition represents a reconfiguration of existing vulnerabilities within a new technological framework.

This report seeks to critically examine this overlooked transition, situating e-rickshaws within the broader historical and socio-economic continuum of rickshaw-based mobility. It highlights how innovation—both technological and institutional—has been uneven, insufficient, or altogether absent in shaping the sector. By foregrounding persistent informality, governance gaps, and the lived experiences of workers, the report moves beyond celebratory narratives of electrification to interrogate the deeper complexities underlying this shift.

At a time when urban policy increasingly emphasizes sustainability, inclusion, and low-carbon futures, it is imperative to recognize that these goals cannot be realized without engaging meaningfully with transport systems at the margins. The transition from cycle rickshaws to e-rickshaws offers critical insights into how innovation is conceived, implemented, and experienced in contexts shaped by informality and inequality. It calls for a more nuanced, grounded approach—one that places workers, livelihoods, and everyday mobility at the heart of urban transformation.

Rajendra Ravi

Executive Summary

E-rickshaws have emerged as a critical component of India's urban transport ecosystem, particularly in metropolitan regions such as Delhi, where they provide affordable, low-emission last-mile connectivity. Positioned at the intersection of climate policy, informal labour, and urban governance, e-rickshaws are increasingly promoted as instruments of sustainable mobility. However, their rapid expansion has occurred within deeply unequal socio-economic conditions, raising urgent questions about livelihood security, regulatory justice, and the inclusiveness of India's electric mobility transition.

This report examines the role of e-rickshaws in climate change mitigation alongside the lived realities of e-rickshaw drivers in the National Capital Territory (NCT) of Delhi. Drawing on primary data collected from 71 e-rickshaw drivers across diverse high-density and low-density locations, complemented by in-depth case studies and field observations, the study adopts a mixed-methods approach to analyse income patterns, expenditure burdens, social composition, working conditions, risks, and interactions with state institutions.

Findings indicate that e-rickshaw driving functions largely as a survival-based livelihood within the informal economy. Average household incomes remain modest and highly variable, while monthly expenditures related to charging, maintenance, parking, loan repayments, and daily subsistence consume a substantial share of earnings. The narrow and unstable gap between income and expenditure leaves most drivers with little or no financial surplus, exposing them to chronic indebtedness and economic shocks. Long working hours—often exceeding 10–12 hours per day—are common, yet do not translate into income security.

The socio-demographic profile of drivers reveals a strong concentration of participation from historically marginalised groups. A majority of drivers belong to OBC and Scheduled Caste categories, have low levels of formal education, and are engaged in the sector due to limited access to stable employment alternatives. Women's participation remains extremely low, reflecting entrenched gendered barriers within urban transport work. These patterns underscore that the benefits of low-carbon mobility are being produced disproportionately by socially and economically vulnerable populations.

The study also highlights significant operational and institutional risks. Nearly half of surveyed drivers reported experiencing road accidents, often linked to poor road infrastructure, mixed traffic conditions, and vehicle design vulnerabilities. Theft of batteries and components is widespread, particularly in the absence of secure parking. Interactions with traffic policing emerge as a major source of economic insecurity, with a high incidence of challans—especially for "No Entry"

violations—often resulting in fines that far exceed drivers' monthly earnings. Enforcement practices are perceived as punitive, poorly communicated, and misaligned with the spatial realities of e-rickshaw operations.

While national and Delhi-level EV policies have aggressively promoted electrification, the report finds that labour and livelihood concerns of informal electric mobility workers remain largely peripheral to policy design. The transition to electric mobility, though environmentally beneficial, risks reproducing existing inequalities unless accompanied by deliberate measures to reduce operational costs, rationalise regulation, provide social protection, and improve infrastructure.

By situating e-rickshaws within a Just Transition framework, this report argues that climate-friendly transport must also be socially just. Ensuring affordable charging, secure parking, fair enforcement, access to insurance and credit, safer road infrastructure, and targeted support for marginalised groups—particularly women and migrant workers—is essential for making Delhi's electric mobility transition inclusive and sustainable. Without such interventions, e-rickshaw drivers will continue to bear the hidden social costs of challan amounts in proportion to income levels of e-rickshaw drivers.

CHAPTER 1

Introduction and Background

1.1 Introduction

The word rickshaw's origin lies in the Japanese language, and it literally translates to "a human powered vehicle". The rickshaw is one of the oldest modes of transport, and was first introduced in the late 19th century. It is used all across the world, but more common in Asian countries especially in India, Bangladesh, Nepal and China. The various types of rickshaws have also evolved over time with the earlier ones being the pulled -rickshaws. Other variations of the mode of transport include the cycle rickshaw, auto rickshaw and the relatively newer iteration of the e-rickshaws. Historically, India's urban as well as rural areas have depended on the various rickshaw types for their travel requirements.

The state of Delhi has close to 1,20,000 [Times Of India 2024] officially registered E-Rickshaws in Delhi but actual number may differ. A large share of e-rickshaws operating on Delhi roads are not officially registered with the transport department, which is why the "on-ground" count is higher than the registry count.

The most modification called the battery operated e-rickshaw (referred as battery rickshaws subsequently in the study) was introduced in the city of New Delhi during the Commonwealth Games 2010 (but in most of areas of New Delhi E-Rickshaws are banned now), with the plan to eventually phase out the physically taxing cycle rickshaws in the city. Even though no government figures are rough estimates but closely the numbers cited by various news reports it is close to 1,20,000 registered vehicles.

E-Rickshaw at the most crowded place in Delhi

1.2 Current Status of E-Rickshaws in India

Across India, e-rickshaws have emerged over the past decade as a critical component of last mile electric mobility, particularly in North Indian cities such as Delhi, Lucknow, Kanpur, Agra, Mathura, Jaipur, and Patna, where they provide affordable, low emission transport linking residential areas with metro stations, markets, and bus terminals. Their rapid growth has been driven by low entry barriers, minimal fuel costs and the absence of viable public transport in many urban peripheries. However, this expansion has also generated significant regulatory tensions across states and municipal jurisdictions.

In Rajasthan, authorities in Jaipur imposed restrictions and partial bans on e-rickshaw movement within the historic Walled City area, citing congestion, tourist pressure, and road capacity constraints. Similar restrictions were introduced on major arterial roads such as Ajmer Road and Delhi Road, limiting e-rickshaw access to designated zones. These measures triggered protests by driver unions, who argued that sudden restrictions directly undermined livelihoods without offering alternative routes or compensation. In response, the Jaipur administration later moved toward a route based and permit limited model, allowing a fixed of e-rickshaws on specific corridors.

"No Entry" Sign board at Dwarka Sector 13 Metro Station but e-rickshaws are still parked

In Uttar Pradesh, cities such as Agra and Mathura witnessed administrative bans on new e-rickshaw registrations, justified on ground of traffic congestion and road safety. However these blanket bans were challenged in court, and the Allahabad High Court intervened, ruling that such prohibitions exceeded administrative authority and violated drivers' right to livelihood. The judgment underscored the legal ambiguity surrounding local governments power to restrict electric mobility modes that are otherwise recognised under national transport law.

Other urban regions, including parts of Delhi NCR, Haryana and Bihar, have adopted selective enforcement strategies, barring e-rickshaws from flyovers, highways and "no entry" zones, while permitting them on interior roads.

Simultaneously, transport departments across states have conducted drives against unregistered or "unfit" vehicles, disproportionately affecting small owner drivers with limited access to formal documentation and repair facilities.

1.3 Origin of E-Rickshaw

E-Rickshaws emerged in India during the early 2010s as an affordable and low-emission mode of last mile transport, yet their rapid expansion occurred largely outside the statutory framework mode of last mile transport, yet their rapid expansion occurred

largely outside the statutory framework of the Motor Vehicles Act, 1988, since they were not initially recognised as “motor vehicles.” As a result, they operated without vehicle registration, third party insurance, or licensed drivers, leading to enforcement difficulties and significant safety concerns; traffic authorities reported multiple accidents and an inability to prosecute e-rickshaw drivers under the law, and passengers lacked compensation right due to absence of insurance coverage (Business Standard 2014).

The Delhi High Court repeatedly criticized this regulatory vacuum, at times banning their plying on public roads and directing authorities to impound unregistered vehicles, noting the hazards posed by vehicles without licenses or insurance (Business Standard 2014). These legal pressures, alongside administrative challenges and public debate over both the benefits and nuisances of E-Rickshaw proliferation, prompted legislative action.

In response, Parliament passed the Motor Vehicles (Amendment) Act, 2015, which inserted Section 2A into the Motor Vehicles Act, 1988, thereby defining "e-cart and e-rickshaw” as battery powered three- wheeled vehicles and explicitly bringing them under the Act’s ambit; the amendment requires such vehicles to comply with all applicable provisions of registration, licensing, fitness, and insurance, aligning them with the mainstream motor vehicle regulation.

Section 2A – E-Cart and E-Rickshaw

(1) *Save as otherwise provided in the provision to sub-section (1) of section 7 and sub-section (10) of section 9, the provisions of this Act shall apply to e-cart and e-rickshaw.*

(2) *For the purpose of this section, “e-cart or e-rickshaw” means a special purpose battery powered vehicle of power not exceeding 4000 watts, having three wheels for carrying goods or passengers, as the case may be, for hire or reward, manufactured, constructed or adapted, equipped and maintained in accordance with such specifications, as may be prescribed in this behalf.*

Earlier before 2015 there was no financing available for the e-rickshaw owners as the e-rickshaws are not recognized by the state as a mode of transport. A Public Interest Litigation filed in the Delhi High Court in January 2014, also pointed out the absence of insurance options for the rickshaws since they were not recognized as motor vehicles in the state. [The Economic Times 2014]

Now E-Rickshaws are recognized under the motor vehicles act. During the collection of the primary sample, E-Rickshaw drivers who were interviewed mentioned that insurance facility is applied on E-Rickshaw if any accident or mishap occurs. But drivers also mentioned about the various basis only drivers could avail the insurance. That would be mentioned in detail in the report in following chapters.

1.4 Electric Vehicle (EV) Policy Brief: Global and National

In response to the twin crises of climate change and urban air pollution, governments around the world have introduced comprehensive electric vehicle (EV) policies to

accelerate the transition away from internal combustion engine (ICE) vehicles. These policies form a core part of national climate commitments, urban air quality strategies and industrial transformation plans.

Global Policy Goals

- Climate mitigation: Many countries include EV deployment in Nationally Determined Contributions (NDCs) under the Paris Agreement 2015, targeting significant cuts in CO_2 emissions from transport.
- Zero emission targets: Several jurisdictions have set ban dates for sales of new ICE vehicles e.g., the European Union initially targeted a near total ban by 2035, although recent policy adjustments now allow a majority (e.g., 90%) of new sales to be zero emission vehicles beyond the date.
- Economic transformation: EV policy is frequently linked to industrial policy supporting local manufacturing, battery production, supply chain development, and innovation ecosystems.

Common Policy Instruments

- Purchase incentives and tax exemptions - tax credits, rebates, or exemptions (e.g., up to $7,500 in the US) to lower upfront costs for buyers.
- Charging infrastructure planning - emissions standards, fuel economy rules, or zero emissions vehicle (ZEV) mandates to shift market share towards EVs.
- End of life battery regulations - emerging frameworks to govern recycling and reuse of EV batteries, recognising environmental and resource management challenges. (Many countries are actively introducing regulatory responses.)

Global Achievements and Challenges

- EV adoption has grown rapidly: in 2025, global EV sales reached approximately 2.3 million units in India alone, reflecting border adoption trends in multiple countries. (Times of India 2025)
- Urban policies increasingly integrate EV strategy with sustainable public transit, non motorised transport and land use planning.
- Challenges persist in grid infrastructure readiness, supply chain bottlenecks, and affordability for low income groups.

Global experience suggests that policy coherence across energy, transport, industry and labour sectors is critical. EV policies focused solely on technology adoption risk excluding equity and labour considerations unless aligned with broader social policy frameworks.

1.4.1 EV Policy in India: National Framework and Direction

Given the importance of the automobile sector in the Indian economy and the evolving mobility paradigm, the government has been responsive in developing policies and schemes to direct the growth of this nascent sector in the night direction.

Some of the key policies undertaken by the Government of India over the last one decade, which have provided support and push to cleaner mobility, are discussed below.

1.4.1.1 Integrated Energy Policy, 2006 and Draft Energy Policy, 2017

The government of India had come up with an Integrated Energy Policy in 2006. The policy recommended promotion of hybrid vehicles and electric vehicles and suggested that efforts should be made to develop low weight and high density batteries the policy also emphasised on promoting commercially available hybrid vehicles in India, and commercially available flexi fuel vehicles, which run on varying proportions of ethanol – blended fuels. The policy proposed fiscal incentives for automotive industries to support commercialisation of hybrid and battery operated vehicles in India.

The draft Energy Policy, 2017 prepared by the NITI Aayog also lays emphasis on mainstreaming emerging energy technologies like EVs. The policy talks about setting up charging stations for electric vehicles and the need for appropriate sub structures for Renewable Energy (RE) to support EVs and energy storage solutions. The policy identifies hybrid vehicles, electric vehicles and fuel cell vehicles to be inducted in the transportation system of the future and indicates the need to utilize their complete potential.

1.4.1.2 National Electric Mobility Mission Plan 2020

National Electric Mobility Mission Plan 2020 (NEMMP) (Ministry of Heavy Industries and Private Enterprises) was launched by the Ministry of Heavy Industries and Public Enterprises in 2013 as a vision towards unveiling the demand for EVs. NEMMP aims to utilize electric mobility as an opportunity to achieve global leadership in manufacturing of EVs and expansion of the domestic market by providing an initial boost that can create demand for EVs, which would stipulate the manufacturing of these vehicles at scale. The four key principles that guide the future roadmap for EV penetration in NEMMP include:

1. Creating consumer acceptability for EVs
2. Developing infrastructure to support ownership and use of EVs
3. Development/acquisition of EV/ battery technology
4. Creation of local manufacturing capability

The plan aims to achieve new vehicle sales of 6-7 million units for full range of EV (mild hybrids to full electric) by 2020. The bulk of this demand is expected to come from (pure) electric two wheelers, followed by hybrid electric vehicles (HEVs) and other (pure) battery electric vehicles (BEVs).

1.4.1.3 Faster Adoption and Manufacturing of (hybrid &) Electric Vehicles, 2015

While the NEMMP acted as a vision, the implementation was to be supported by Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles, 2015 (FAME India).

Under FAME, demand incentive is provided to buyers which can be availed by buyers upfront at the point of purchase and the same is reimbursed to the manufacturers from Department of Heavy Industries (DHI) on a monthly basis.

With the aim of boosting adoption of EVs, in January 2018, DHI approved pilots for 390 electric buses, 370 electric taxis, 720 electric auto and INR 40 crore for setting charging infrastructure spread across 11 Indian cities.

1.4.1.4 Automotive Mission Plan, 2026

Complementing the government's 'Make in India' vision and establishing the Indian automotive industry as one of the top three in the world, the Ministry of Heavy Industries and Public Enterprises prepared a comprehensive Automotive Mission Plan (AMP), FOR 2016-2026. Specific focus was given to implementation of emission standards across India, in addition to pilot projects, charging infrastructure and component manufacturing for EVs.

1.4.1.5 New Draft EV Policy

While NEMMP, FAME and AMP aim to guide the growth of EVs, an integrated electric mobility policy is expected to be in place soon. Given the need for inter-departmental/ ministerial coordination, the government has assigned NITI Aayog with the task to coordinate the development of the policy that can guide the penetration of EVs in the country.

The review of the emerging e-mobility landscape suggests that newer business opportunities, propelled by favorable policy support, are reshaping the mobility landscape. To drive the adoption of EVs, it is critical to upscale the penetration of EVs in a short period of time, which in turn will require identification of the front runners which may trigger exponential uptake of EVs

1.4.2 Delhi's EV Policy

Delhi has been one of India's most proactive subnational entities in EV policymaking. Its early policy frameworks (from 2020 onwards) set Delhi apart as an urban EV pioneer, combining demand incentives, infrastructure planning, and regulatory encouragement. The policy was primarily introduced to address Delhi's severe air pollution, reduce vehicular emissions, and accelerate a shift towards clean and sustainable urban transport. It aimed to achieve 25% electric vehicle adoption in new vehicle registration by 2024, with a strong focus on high impact segments such as two wheelers, three wheelers (including e-rickshaws), taxis and delivery vehicles. Key policy instruments included purchase incentives, exemption from road tax and registration fees, interest subvention on loans, and the creation of a dedicated EV fund to support infrastructure development. The policy also prioritized the expansion of public and private charging infrastructure, mandating charging points in new buildings and public spaces. While Delhi has made notable progress reaching close to one fifth of new vehicle registration as EVs, the policy's implementation reveals gaps in affordability, financing access, and livelihood protection for informal transport

Government Charging Station at Lajpat Nagar, Delhi

workers such as e-rickshaw drivers. The proposed Delhi EV Policy 2.0 with it ambitious target of 95% EV adoption in new registrations by 2027, underscores the city's commitment to rapid electrification, but also highlights the urgent need to integrate labor welfare, income security and regulatory support for informal electric mobility workers to ensure a just and inclusive transition.

This paper tries to recommend the rules for the smooth functioning of the rickshaws in the state of Delhi, by examining the socio-economic as well as the technical characteristics of these types of vehicles. This report will also tries to analyse the interaction of E-Rickshaw drivers with the state and traffic police, as it was mentioned by the Delhi traffic police that there were around 2,78,090 challans in a year for rule violations by E-Rickshaws, mainly of 'no entry, no parking'.

By forming various rules and regulations for e-rickshaw drivers and the vehicle would help in improving the functioning of the occupation, better urban planning and improving the transport infrastructure in Delhi. As one of E-Rickshaw drivers mentioned *"Sarkar ne e-rickshaw walon ko apne hi haal par chhod diya hai; kanoon mein bas rok hai, sahuliyat kahin nahi hai."*

("The government has left e-rickshaw drivers to fend for themselves; the laws only impose restrictions, with no facilities provided anywhere.")

— E-rickshaw driver, Delhi (Primary Survey, 2024)

Objectives of the Study

1. Assess the **livelihoods, working conditions,** and **challenges** e-rickshaw drivers face in Delhi NCT.
2. Investigate the **existing regulatory framework** for e-rickshaws in NCT Delhi.
3. Identify challenges e-rickshaw operators face, including financial, infrastructural, and technical barriers.
4. Conduct a detailed case study of e-rickshaw operations in NCT Delhi, including a review of infrastructure, financing options, and policies.

Literature Review

The Battery Operated Electric Rickshaws is a new mode of transportation introduced in the state of Delhi in 2010. The number of these types of rickshaws has increased

from 4,000 in 2010 to approximately 1,00,000 in 2014. These e-rickshaws are a popular mode of transport for short distance commute within the city, and almost half of the city population in Delhi commute through e-rickshaw as last mile connectivity.

E-Rickshaw have emerged as a significant component of urban transport systems in India, particularly in metropolitan regions such as Delhi, where they play a crucial role in last mile connectivity. However, early studies note that this growth occurred largely outside formal regulatory frameworks, resulting in operational, safety, and governance challenges (Centre for Civil Society [CCS], 2014). Scholarly research examining the acceptability of e-rickshaws in Delhi highlights their role as a socially embedded transport innovation. Singh, Mishra and Tripathi (2021) analyse e-rickshaws through a responsible innovation lens, arguing that affordability, employment generation, and environmental benefits drove widespread adoption despite the absence of adequate safety standards and institutional oversight. Their findings suggest that while users and drivers perceived e-rickshaws as beneficial, long term sustainability required formal governance mechanisms.

Several studies focus on regulatory and safety concerns arising from the initial exclusion of e-rickshaws from the Motor Vehicles Act, 1988. Policy and legal analyses document how the lack of vehicle registration, third party insurance, and licensing created enforcement challenges and heightened risks for passengers and other road users (Down To Earth, 2021). These regulatory gaps prompted judicial intervention, particularly in Delhi, and ultimately led to the formal inclusion of e-rickshaws under the Motor Vehicles (Amendment) Act, 2015.

Infrastructure and operational issues from another major theme in the literature. Empirical studies on charging behaviour in Delhi indicate that drivers rely heavily on informal charging arrangements, often during midday breaks, which influences route choices and daily earnings. Research suggests that planned charging infrastructure is essential to improve efficiency and reduce operational uncertainty (Transport Research International Documentation [TRID], 2020).

Beyond Delhi, national and international literature situates e-rickshaws within broader discussions on electric mobility and sustainable transport. Doley, Maurya, and Nama (2023), in critical literature review, examine electric three wheeler paratransit, highlighting environmental benefits alongside concerns related to vehicle design, battery technology, and road safety. Similarly, Rana et al 2013 showed the role of the battery operated rickshaws in the urban income generation and the employment creation in Bangladesh. It also shows the role of the mode of transport in depressurisation of the migration to the capital of Dhaka. [Rana et al 2012 b] checks the efficiency of the battery operated rickshaws in Bangladesh, and recommends route fixation and the issuance of driving licenses to increase the efficiency in these areas. The situation in Bangladesh is similar to the one observed in Delhi, as a report estimated that there were more than 50,000 unlicensed battery rickshaws in the cities of Dhaka and Chittagong. The High Court in July 2014, rejected writ petitions that sought permission to allow the functioning of these vehicles in the cities, and banned the rickshaws in Dhaka and Chittagong. [Daily Star 2014]

[Nandhi - I.F.M.R. 2011] studied the financial behaviour of the cycle rickshaw pullers in Delhi, and showed the use of a case study method to substantiate their findings. The results were utilized to assess the rickshaw pullers' strategies and choices in savings as well as to address the challenges faced by them. The case study method has been applied in the study to elucidate the importance of the mode of transport in a social context.

Methodology

The study adopts a mixed methods research design, combining both quantitative and qualitative approaches to examine the role of e-rickshaw in climate change mitigation and the socio-economic conditions of e-rickshaw drivers in the National Capital Territory (NCT) of Delhi. The mixed methods approach enables the analysis of measurable trends alongside in-depth narratives of drivers' lived experiences, parking owners, operational practices, and policy interactions.

The study was conducted across selected locations in NCT Delhi using a purposive area selection strategy. Survey locations were categorized into high density and low density areas based on the concentration of e-rickshaws and passenger demand. High density areas included major metro stations, commercial markets, hospitals, and educational institutions where e-rickshaw ridership is consistently high. Low density areas comprised peripheral residential zones and metro stations with limited or peak hour only demand. This categorization ensured representation of varied operational contexts across the city.

A total of 71 e-rickshaw drivers were surveyed for the quantitative component of the study. The sample was distributed across both high- density and low density locations to reflect actual ridership patterns. Respondents were selected through on site intercept sampling at identified e-rickshaw stands and operating points.

For the qualitative component, in depth interviews, focus group discussions (FGDs) and case studies were conducted with a purposively selected sub-sample of drivers. Participants were chosen to capture variation in ownership status (owned or leased), years of experience, and location of operation. Field observations were carried out at e-rickshaw hubs to document charging practices, parking arrangements, and everyday operational dynamics.

Focus Group Discussion with E-Rickshaw drivers at Bawana, Delhi

The primary data collection occurred in: Jhilmil Metro Station (Shahdara District, East Delhi), Mansarovar Park Metro Station (Shahdara District, East Delhi), Dilshad Garden Metro Station, East Delhi), Seelampur and Welcome Metro vicinity (North East Delhi District), Kashmere Gate Metro Station (Central Delhi

District), Nagloi and Rajdhani Park Metro Station (West Delhi District), Mundka Metro Station (West Delhi District), Dwarka and Dwarka Sector 11,13,14 Metro Stations (South West Delhi District), Delhi Cantt area (New Delhi District), Jamia Milia Islamia Area, Shaheen Bagh, Okhla Vihar (South East Delhi District), Punjabi Bagh Metro Station (West Delhi District), Harkesh Nagar Metro Station (South East District), Govindpuri (South East District), Model Town Metro Station (North Delhi District), Bawana (North West District).

Quantitative data were analyzed using descriptive statistical techniques, including averages and comparative trends, and presented through tables and charts. Qualitative data were analyzed using thematic analysis to identify key patterns related to livelihoods, infrastructure, governance and climate related challenges. The common questionnaire was formed to study the qualitative and quantitative aspects of the e-rickshaws.

CHAPTER 2

Analysis of the Primary Data Collection

2.1. Income of the respondents: Analysis of Average Monthly Income of E-Rickshaw Drivers

71 respondents were interviewed during the duration of field survey at various locations of Delhi. The income data of surveyed e-rickshaw drivers reveals a pattern of low to moderate earnings with significant variability, reflecting the precarious nature of livelihoods within the informal electric mobility sector. The income which is being analysed here is the whole household income. Monthly income of the household ranges from as low as ₹ 10,000 to a maximum of ₹ 60,000, indicating a wide disparity in earning capacity among the drivers' household members.

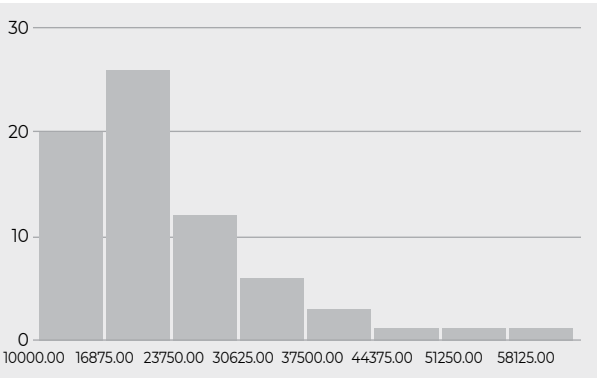


Figure 1

A substantial proportion of respondents earn between ₹ 15,000 and ₹ 25,000 per month, which can be considered the dominant income bracket. This range represents subsistence level earnings in an urban context like Delhi, especially when accounting for household responsibilities, rising living costs, and work related expenses such as charging, maintenance, food, and informal payments. Drivers earning at the lower end of the spectrum (₹ 10,000 - ₹ 15000) face heightened economic vulnerability, often relying on extended working hours or supplementary income to sustain their households. In most cases at the lower end only the respondent earns in the family that's why the income is very less.

At the upper end, a limited number of drivers report incomes above ₹ 40,000, with a few outliers household income is close to ₹ 55,000 - ₹ 60,000, where more than one person is earning in the family. However, qualitative evidence from case studies suggests that higher income does not necessarily translate into financial security, as these drivers also incur higher operational costs, experience physical exhaustion and remain exposed to accidents, weather risks and enforcement-related uncertainties.

Overall, the income distribution underscores that e-rickshaw driving in Delhi functions largely as a survival - oriented occupation rather than a stable livelihood pathway. From a Just Transition perspective, this finding highlights the need for policy interventions aimed at income stabilization, reduction of operational costs (particularly battery and charging expenses), and the extension of social security measures to ensure that the benefits of low carbon transport do not come at the cost of worker well being.

2.2. Monthly Expenditure Distribution of E-Rickshaw Drivers

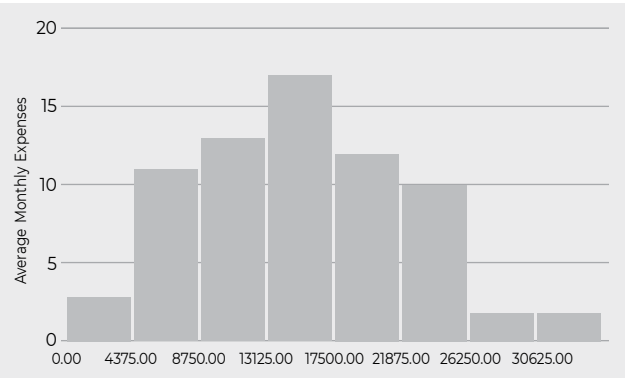


Figure 2

The monthly expenditure data of e-rickshaw drivers reveals a consistently high cost burden associated with operating and sustaining livelihoods within Delhi's informal electric mobility sector. Most respondents incur monthly expenses ranging between ₹ 12,000 and ₹ 22,000 indicating that a significant portion of their earnings is absorbed by routine operational and subsistence costs. These expenses primarily include battery charging, informal parking payments, daily food and travel costs, loan repayments and regular vehicle maintenance.

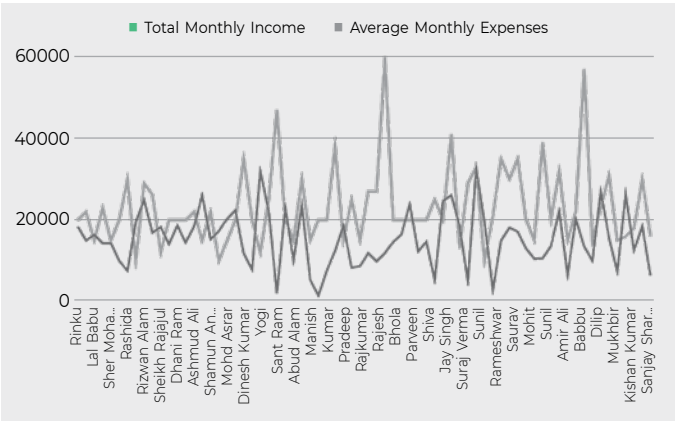
A smaller but important segment of drivers reports monthly expenditures exceeding ₹ 25,000 with a few outliers approaching ₹ 30,000 - ₹ 32,000. Such elevated expenses are typically linked to higher repair frequency, battery related costs, debt servicing, loan payment of e-rickshaw, or greater dependence on paid charging and parking infrastructure. These drivers are particularly vulnerable to income shocks, as even minor disruptions such as battery failure, rain induced damage or police enforcement can push expenditures beyond sustainable limits.

When viewed alongside income patterns, the expenditure data highlights a narrow margin between earnings and costs. For many drivers, monthly expenses consume a substantial share of total income, leaving limited room for savings, healthcare, or emergency needs. This reinforces the finding that e-rickshaw driving operates largely as a survival based occupation, rather than a pathway to financial security.

From a policy and Just Transition perspective, the expenditure burden underscores the urgency of intervention aimed at reducing operational costs particularly through affordable charging infrastructure, regulated parking spaces, improved battery durability, and access to low interest credit. Without such measures, the economic risks of climate friendly transport continue to be disproportionately borne by drivers, undermining the social sustainability of Delhi's electric mobility transition.

2.3. Income and expenditure Curve: Trends and Interpretation

Variable	Mean (₹)	Mode (₹)	Key Observation
Total Monthly Income	23,003	20,000	Income is clustered around lower brackets, with few high-income outliers raising the mean
Average Monthly Expenditure	15,318	10,000	Expenditure is relatively rigid and unavoidable, driven by livelihood and household costs



The comparative line chart of average monthly income and average monthly expenditure reveals a persistent and fragile gap between earnings and costs among e-rickshaw drivers. Across most respondents, income levels remain consistently higher than expenditure, however, the margin between the two curves is narrow and unstable, indicating limited financial resilience. Rather than slowing a steady surplus, the chart reflects frequent convergence points where expenditure nearly equals or in some cases, approaches income.

A key trend emerging from the chart is the high volatility of income compared to expenditure. Income exhibits sharp fluctuations, with peaks for a small number of respondents and sudden drops for others, reflecting dependence on daily ridership, location, battery performance, weather conditions, and enforcement practices. In contrast, expenditure shows comparatively less variation and remains consistently present, highlighting the fixed and unavoidable nature of costs such as charging, parking payments, loan repayments, food and regular repairs.

Importantly, income figures are largely self reported and estimated by respondents, whereas expenditure represents more tangible and recurring outflows. This discrepancy suggests that actual disposable income may be lower than reported, contributing to widespread indebtedness despite apparent income expenditure gaps. Overall, the chart illustrates that e-rickshaw driving operates within a low-surplus, high risk environment, where drivers remain financially vulnerable even when monthly earnings appear adequate.

From a policy and Just transition perspective, the income expenditure trend underscores the urgency of reducing operational costs, stabilising earnings and extending social protection. Without such interventions, the transition to electric mobility risks sustaining livelihoods that are environmentally beneficial but economically insecure.

An approximate comparison of average monthly income and expenditure indicates that most e-rickshaw drivers operate with a very limited or unstable surplus, and a significant proportion experience monthly deficits. With a median income of around ₹ 20,000 and average monthly expenses frequently ranging between ₹ 15,000 and ₹ 20,000, the effective surplus for man drivers lies between ₹0 and ₹5,000 and in several cases turns negative.

Drivers whose monthly income falls in the ₹ 10,000 - ₹ 15,000 range are particularly vulnerable. For this group, average expenses driven by charging costs, daily food, parking payments, loan repayments, and routine repairs often exceed income, pushing them into persistent indebtedness. Even among drivers earning ₹ 20,000 - ₹ 25,000, the

surplus remains marginal and highly sensitive to shocks such as battery failure, rain related damage accidents or police enforcement.

A small group of higher income drivers (above ₹ 35,000 per month) shows a clever surplus; however, qualitative evidence suggests that these drivers also incur higher operational costs, longer working hours, and greater physical strain. As a result, higher income does not consistently translate into long term financial security.

Overall, the surplus deficit pattern confirms that e-rickshaw driving in Delhi functions as a low margin livelihood, where economic survival depends on continuous work with little buffer against risk. From a Just Transition perspective, this underscores the need for policies focused on cost reduction, income stabilization and social protection rather than relying solely on vehicle electrification as a marker of sustainability.

2.4. Gender Composition of E-Rickshaw Drivers

Gender	Number of Respondents	Percentage (%)
Male	69	97%
Female	2	3%
Total	71	100%

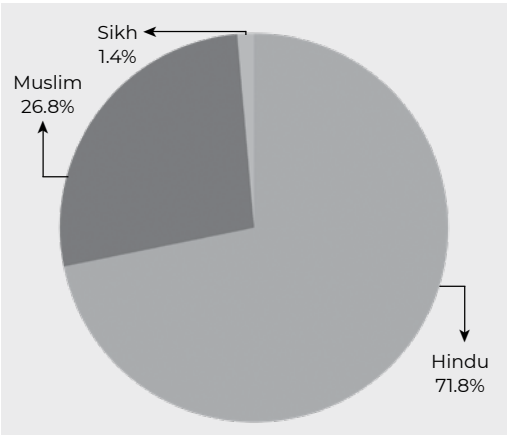
The pie chart indicates an overwhelmingly male dominated composition of the e-rickshaw driving workforce in NCT Delhi. Out of 71 respondents, 97%, 69 respondents are male, while only 3%, 2 respondents are female. This stark imbalance highlights the deep gendered nature of employment within the urban transport and informal mobility sector.

The extremely low participation of women reflects multiple structural barriers, including concerns around road safety, long and irregular working hours, occupation is mostly dominated by the men and leaves an less space for the women to drive, it also reflects that policy wise the sector is not very inclusive for the women's, and other social norms, existence of patriarchy in society which also stops women to work in this sector. But while doing data collection met many other women's e-rickshaw, but couldn't take interviews but did interacted with them. Many women also mentioned that at the stand many men also dominate the stand and one driver also reported that her money from the rickshaw was stolen from the informal stand, she doubts that other e-rickshaw drivers would have only stolen her money. But the number of women is comparatively very low compared to men. Despite e-rickshaws being promoted as a low skill and inclusive livelihood option under electric mobility frameworks, the findings suggest that gender inclusion remains largely unaddressed in practice.

The presence of even a small number of women drivers, however, indicates emerging possibilities for diversification, particularly if supported through gender sensitive policy measures such as safer parking and charging infrastructure, targeted financial schemes, and social security schemes targeting the women to come in front. Strengthening these interventions could enhance women's participation in cleaner and sustainable urban transport systems.

2.5. Religious Composition of E-Rickshaw drivers

Religion	Number of Respondents	Percentage (%)
Hindu	51	72%
Muslim	19	27%
Sikh	1	1%
Total	71	100%



The pie chart illustrates the religious distribution of the 71 e-rickshaw drivers surveyed across NCT Delhi. A majority of respondents identify as Hindu (72%, 51 respondents), followed by Muslims (27%, 19 respondents), while Sikhs constitute a very small proportion of the sample (1%, 1 respondent).

When compared with the religious composition of the general population of NCT Delhi (Census 2011), where Hindus constitute approximately 81.7%, Muslims 12.9%, and Sikhs 3.4%, the sample indicates a relative overrepresentation of Muslim respondents and a relative underrepresentation of Hindus and Sikhs. However, given the limited sample size (n = 71), these differences should be interpreted cautiously and cannot be treated as statistically representative of the broader e-rickshaw workforce.

The observed pattern may tentatively suggest that e-rickshaw driving functions as an accessible livelihood option for economically vulnerable communities, including segments of religious minorities. Nevertheless, participation in the sector is more likely shaped by migration patterns, access to low-capital entry occupations, and socio-economic constraints rather than religious affiliation per se.

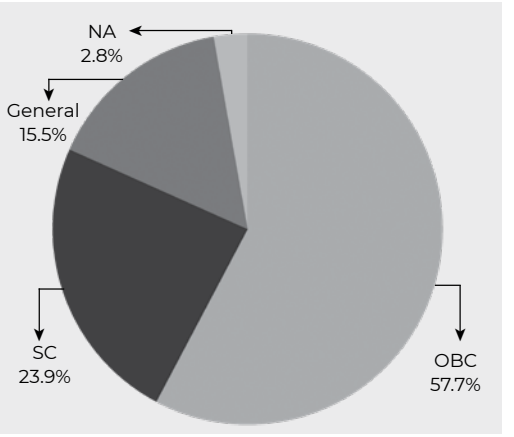
Importantly, the findings suggest that e-rickshaw driving cuts across religious lines, functioning as shared economic space for marginalized urban workers. However, variations in lived experiences such as interactions with police, access to credit or spatial mobility may still interact with religious identity and warrant deeper qualitative exploration.

2.6. Caste Wise Distribution of E-Rickshaw Drivers

The caste composition of the surveyed e-rickshaw drivers reveals a strong concentration of participation from historically marginalised social groups. A majority of respondents (58%) belong to Other Backward Classes (OBC), followed by Scheduled Castes (SC) at 24%. Together, these groups constitute over four-fifths of the total sample. In contrast,

15% of respondents belong to the General Category, while 3% did not disclose their caste identity.

Caste Category	Number of Respondents	Percentage (%)
OBC	41	58%
SC	17	24%
General	11	15%
NA	2	3%
Total	71	100%



When compared with broader demographic patterns in Delhi, certain disparities become visible. According to Census 2011, Scheduled Castes constitute approximately 16.8% of Delhi's population, while Scheduled Tribes account for less than 1%. Although the Census does not provide official figures for OBCs, National Sample Survey (NSS) estimates suggest that OBCs constitute roughly 40–45% of Delhi's population. In this context, the proportion of SC respondents (24%) in the sample appears higher than their share in the general population, and OBC representation (58%) also appears elevated relative to broader demographic estimates.

However, given the limited sample size (n = 71) and the absence of precise caste-disaggregated census data for OBCs in Delhi, these comparisons should be interpreted cautiously. The findings are indicative rather than statistically representative.

Nevertheless, the observed pattern suggests that e-rickshaw driving functions as a low-entry, informal urban occupation that disproportionately attracts individuals from historically disadvantaged caste backgrounds. Participation in the sector appears shaped less by caste identity alone and more by structural factors such as limited access to formal employment, educational constraints, migration histories, and the relatively low capital requirement for entry into the occupation.

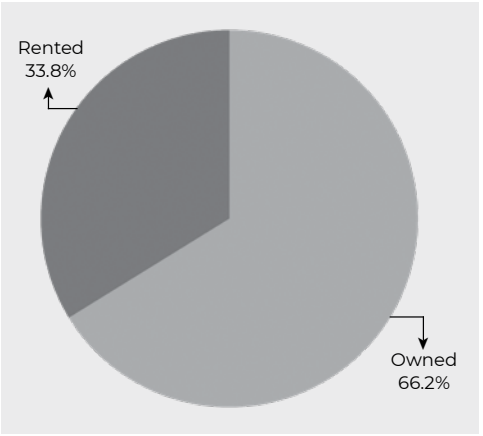
This distribution suggests that e-rickshaw driving functions as an important livelihood option within the urban informal economy, particularly for groups facing barriers to formal employment due to limited education, migration status, or lack of social capital. The composition of OBC and SC drivers reflects broader structural inequalities in urban labour markets, where marginalized communities are more likely to be absorbed into low capital, high risk occupations such as informal transport services.

From a policy and Just Transition perspective, this composition underscores the need for equity-oriented electric mobility policies. As e-rickshaws are promoted as

climate friendly transport solutions, it is crucial that policy frameworks also address social justice concerns by ensuring access to subsidies, social security, insurance and safe working conditions for the communities that disproportionately sustain this low emission mobility system.

2.7. Ownership Pattern of E-Rickshaws: Analysis and Interpretation

Ownership Type	Count	Percentage
Owned	47	66%
Rented	24	34%
Total	71	100%



The ownership structure of e-rickshaws among the surveyed respondents reveals a mixed but unequal economic arrangement. As shown in the pie chart and table, 66% (47 respondents) reported owning their e-rickshaw, while 34% (24 respondents) operated rented vehicles. At first glance, the dominance of ownership may suggest relative asset security among drivers; however, deeper analysis indicates that ownership does not necessarily translate into financial stability.

Data from the loan and purchase details show that a significant proportion of owned e-rickshaws were acquired through formal EMI based loans, informal borrowing, instalment based purchases or borrowing from private financiers, rather than outright purchase. Many drivers reported monthly EMI burdens ranging between ₹ 8,000 and ₹ 12,000, often extending over 18 months to two years. Formal loans were typically taken in the driver's own name or that of a family member, while informal loans frequently involved previous owners, relatives or local financiers, often with opaque or high interest terms.

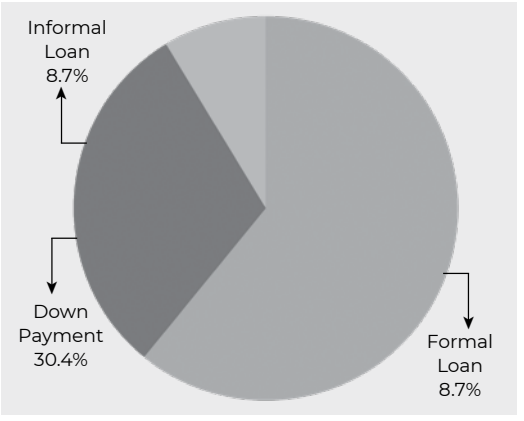
While the report's findings highlight the precarious economic conditions of e-rickshaw drivers including low and irregular incomes, high operating costs, debt burdens, and unstable livelihood outcomes — these drivers continue to enter and remain in the occupation because the alternatives are often more insecure, less accessible, or entirely absent. E-rickshaws have proliferated across Indian cities, including Delhi, precisely because they offer **low-capital entry, cheap operational costs, and an accessible income source relative to alternatives such as manual labour, cycle rickshaw work, or other informal jobs.** This dynamic has made e-rickshaws a **significant driver of India's electric vehicle market,** comprising around 83% of all electric vehicles in the country, with an estimated 1.5 million units nationwide and ongoing annual sales growth.

According to Down to Earth, e-rickshaws have emerged as a "winner" in India's electric mobility transition due to their **affordability compared to internal combustion engine vehicles, lower purchase and running costs, and socio-economic benefits for drivers,** many of whom would otherwise lack entry into motorised transport work. The initial cost of an e-rickshaw (approximately ₹60,000–₹1.1 lakh) and the operational cost per kilometre (around ₹0.4) remain far lower than traditional auto-rickshaws, making them attractive even in contexts of extreme economic vulnerability.

These structural advantages help explain why, despite tenuous income–expenditure balances and ongoing vulnerability, many drivers continue in the occupation: **e-rickshaw driving remains one of the few viable opportunities available to economically disadvantaged workers,** especially migrants, scheduled caste and Other Backward Class households, and those lacking secure formal employment. In other words, the profession persists not because it guarantees stability, but because it often offers *better income prospects than competing informal livelihoods* — even if modest and precarious — alongside participation in a rapidly growing electric mobility ecosystem. This dual nature — low barriers to entry but high vulnerability — underscores the complexity of the e-rickshaw driver experience within India's broader electric vehicle transition.

2.8. Mode of Financing for E-Rickshaw Purchase (Formal Loan, Informal Loan & Down Payment)

Mode of Payment	Number of Respondents	Percentage (%)
Formal Loan	28	60%
Down Payment	14	30%
Informal Loan	4	8%
Total	47	100%



The pie chart represents the financing modes adopted exclusively by respondents who own their e-rickshaw, 47 respondents, as loan liabilities and ownership related payments apply only to this category. Among these owner operators, formal loans emerge as the most prevalent mode of purchase, accounting for 60% (28 respondents). These loans are typically accessed through banks, non banking financial companies (NBFCs), or dealer facilitated credit arrangements, indicating a growing formalisation of financing within the e-rickshaw sector. Finance is being done through the showroom where e-rickshaw are being sold, their only finance company people also sit there, and finance company interest rates touch to 30% also in some cases.

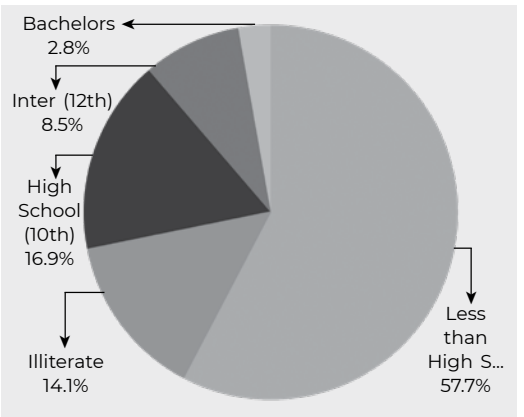
At the same time, 30% (14 respondents) reported acquiring their e-rickshaws through down payments, suggesting partial self financing combined with informal borrowing or household savings. Some drivers who used to work earlier got their salary and left the job, from that money they purchased e-rickshaw. This group often seeks to avoid long term EMI commitments but remains vulnerable to sudden repair or battery replacement costs.

A smaller share of owners (8%, 4 respondents) depended on informal loans, sourced from friends, relatives or local moneylenders. Although limited in proportion, this group faces higher financial precarity due to the absence of fixed repayment terms and the potential lending practices.

Overall, while ownership is associated with access to formal credit, the data reveals that debt formal or informal remains central to e-rickshaw ownership, reinforcing patterns of long term indebtedness despite the sector's role in promoting low emission urban transport.

2.9. Educational Attainment of E-Rickshaw Drivers

Education Level	Number of Respondents	Percentage (%)
Less than High School	41	58%
Illiterate	10	14%
High School (10th)	12	17%
Inter (12th)	6	8%
Bachelors	2	3%
Diploma	0	0.00%
Masters	0	0.00%
Total	71	100%



The educational distribution of e-rickshaw divers in the survey highlights a predominantly low level of formal education, reflecting structural barriers to schooling and limited access to stable employment opportunities.

A majority of respondents, 58 (41 out of 71), have education below high school, indicating early school dropout. This group largely enters the informal labour market at a young age due to financial stress, migration or lack of access to quality education. Additionally, 14% (10 respondents) are illiterate, underscoring deep educational exclusion among a significant section of drivers.

At the secondary, 17% completed Class 10, while 8% studied up-to Class 12. Despite reaching these levels, respondents were unable to transition into formal or skilled employment, pushing them towards e-rickshaw driving as a livelihood option. Higher education is extremely limited: only 3% (2 respondents) hold a bachelor's degree and no respondents reported diploma or postgraduate qualifications. This absence reflects systemic barriers rather than individual choice. Diploma and postgraduate education require financial investment, sustained time, institutional access and social capital all of which are largely unavailable to respondents from economically marginalised backgrounds. Limited availability of vocational institutions in peri urban and migrant settlements, coupled with the uncertain employment returns of higher education, further discourages continued study.

Moreover, even respondents who completed secondary or higher secondary education reported inadequate employment opportunities matching their qualifications, leading to downwards occupational mobility into informal transport work.

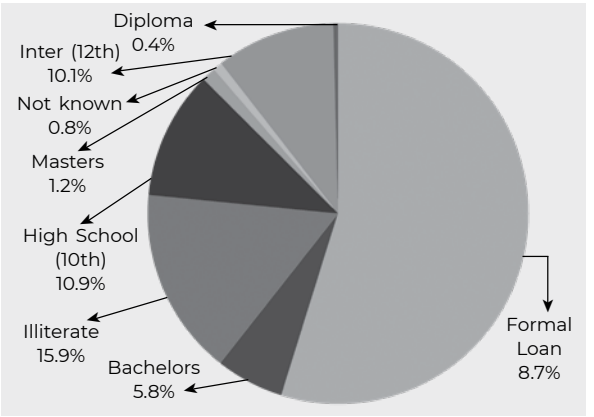
For many respondents, migration to Delhi occurred during adolescence or early adulthood, interrupting formal education and pushing them into informal work. E-Rickshaw driving thus emerges as a survival based urban livelihood, requiring minimal formal education but offering immediate credit by the end of the day. This educational educational background also influences occupational mobility, as limited schooling restricts access to formal sector employment, vocational training and stable wage jobs.

Low educational attainment has wider implications for the e-rickshaw ecosystem. Drivers with less than high school education face difficulties understanding regulatory requirements, it also affects their capacity to adopt new technologies, such as advanced battery systems or digital payment platforms. The high proportion of school dropouts highlights the need for policy designs that are accessible, and supported by on ground facilitation, the policies interactions should be inclusive, along with financial literacy, skill upgradation initiatives to strengthen both livelihood security and participation in India's electric mobility transition. Overall, the surplus deficit pattern confirms that e-rickshaw driving in Delhi functions as a low margin livelihood, where economic survival depends on continuous with little buffer against risk. From a Just Transition perspective, this underscores the need for policies focussed on cost reduction, income stabilization, and social protection rather than relying solely on vehicle electrification as a marker of sustainability.

Overall, the data reveals that e-rickshaw during driving functions as a fallback occupation for individuals with limited educational credentials and constrained employment choices. The findings underline the need for skill based training. Stronger education to employment linkages to improve livelihood security and reduce long term vulnerability within this workspace.

2.10. Educational Status of Household Members of E-Rickshaw Drivers

The educational composition of e-rickshaw drivers and their family members reflects structural educational disadvantages combined with constrained intergenerational mobility. More than half of the surveyed households (55%) reported education levels



below high school, indicating widespread early school dropout among both drivers and adult family members. This trend is reinforced by the presence of 16% illiterate individuals, highlighting limited access to formal schooling especially among older generations and migrant households.

At the secondary level, 11% have completed Class 10 and 10% have studied upto Class 12, suggesting that a section of respondents and their family members were able to access schooling but were unable to transition into higher education. Financial pressures, early entry into the workforce, migration and lack of institutional support emerge as key reasons for educational discontinuity within households.

Higher education remains marginal within these families. Only 6% reported bachelor's degrees, while 1% had postgraduate education and 0.4% held diplomas. These figures indicate that even if family members attain higher education, employment outcomes remain uncertain, often pushing households to rely on informal livelihoods such as e-rickshaw driving.

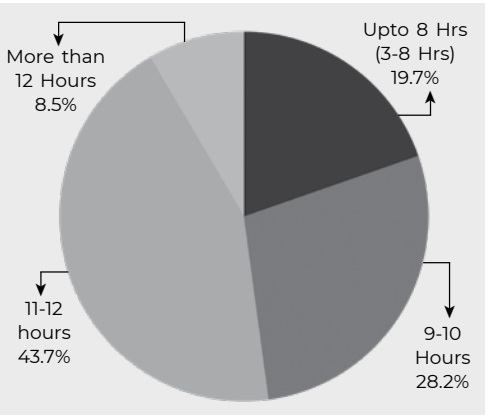
The educational profile at the household level reveals a cycle of vulnerability, where low education limits access to formal employment, reinforcing dependence on informal transport work. At the same time, the presence of educated family members reflects aspirational mobility, though constrained by urban labour market realities. This underscores the need for education to employment linkages, skill based training and targeted support for children and youth within e-rickshaw households to break intergenerational patterns of precarious work.

2.11. Daily Working Hours of E-Rickshaw Drivers

Combined Working Hours	Number of Drivers	Percentage
Up to 8 Hours (3–8 hrs)	14	20%
9–10 Hours	20	29%
11–12 Hours	31	44%
More than 12 Hours (13–16 hrs)	6	8%
Total	71	100%

The distribution of working hours, based on self-reported survey responses, indicates that e-rickshaw driving is an extremely labour-intensive livelihood. A majority of respondents (44%) reported working 11–12 hours per day, while an additional 28%

worked 9–10 hours daily. Taken together, nearly 72% of drivers reported working more than nine hours per day. A further 8% reported working more than 12 hours daily. These figures suggest prolonged exposure to physical strain, traffic risks, and environmental stress.



Since these findings are based on self-reporting, it is important to consider their reliability. Working hours are generally easier for respondents to recall compared to income or expenditure data, as they reflect routine daily schedules rather than fluctuating financial figures. Moreover, the reported range of 9–12 hours aligns with patterns documented in studies of informal urban transport workers in India, which similarly note extended daily working hours driven by income insecurity and market competition. The internal consistency of responses—where longer working hours correspond with reported financial strain—also strengthens confidence in the plausibility of the data.

Although the study did not employ independent time-use tracking or observational verification, the convergence between quantitative responses and qualitative interviews supports the validity of the findings. Drivers consistently described extended working hours as economically compelled rather than voluntary, reinforcing the interpretation that long workdays are a structural feature of the occupation.

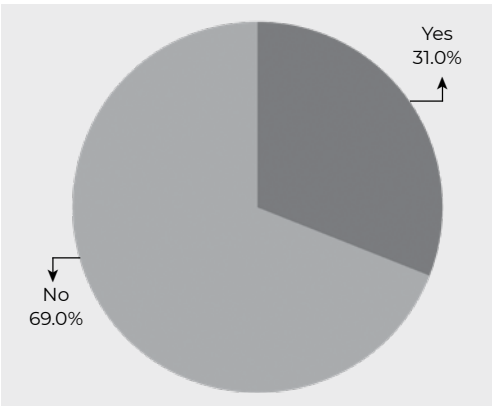
Despite these long hours, qualitative findings indicate that minimum wage equivalents are often not met. Extended working hours do not translate into proportionately higher income due to declining ridership, high operating costs (charging, maintenance, repairs), informal payments, and market saturation. Drivers therefore work longer not to increase earnings, but to stabilise household subsistence levels.

The absence of regulated working conditions, income stabilisation mechanisms, or institutional protections places e-rickshaw drivers in a structurally vulnerable position within the informal economy. Long working hours combined with uncertain and fluctuating returns increase exposure to fatigue-related accidents and health risks. Rather than framing this in terms of statutory minimum wages—given the absence of a formal employer–employee relationship—the findings point toward the need for income stabilisation measures. These may include regulated fare structures, transparent rental and financing arrangements, access to affordable credit, inclusion in existing social security schemes for unorganised workers, and accident or health insurance coverage.

Such mechanisms would not convert the occupation into formal employment but could reduce income volatility and livelihood insecurity, particularly considering the sector's contribution to last-mile connectivity and low-carbon urban mobility.

2.12. Experience of Theft and Asset Loss among E-Rickshaw Drivers

Theft Reported	Number of Respondents	Percentage
Yes	22	31.00%
No	49	69.00%
Total	71	100%



Primary survey data indicates that 31% of respondents (22 out of 71) reported experiencing theft related to their e-rickshaw, while 69% reported no such incident. Although a majority did not directly experience theft, the proportion reporting losses is significant and highlights persistent vulnerabilities associated with informal transport work in Delhi.

An analysis of the qualitative responses shows that theft is largely component specific rather than vehicle wide, with the most frequently stolen items being:

1. Batteries (acid lead and lithium batteries)
2. Chargers (often costing ₹ 5,000 - ₹ 15,000)
3. Motor and Controller Units
4. Stefany
5. Accessories

Battery theft emerged as the most common and economically damaging, particularly from parking spaces. Several respondents reported that batteries were stolen at night from informal parking locations, discouraging them from filing police complaints due to fear of eviction or penal action against parking operators. Several respondents stated that although they approached police stations, cases were either not registered or not pursued, especially when the e-rickshaw were unregistered or parked at an informal stand. In some instances, drivers avoided filing complaints altogether due to fear that police action would lead to penalties, eviction from parking sites or harassment of parking operators.

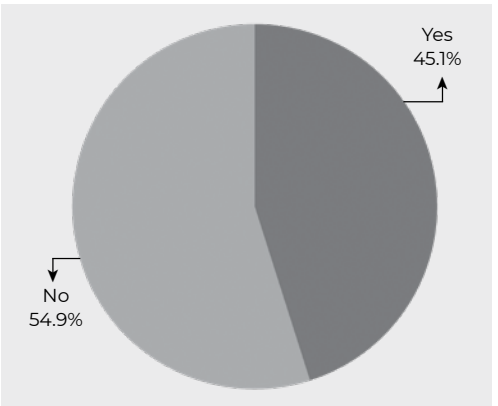
Multiple respondents explicitly reported that police refused to file FIRs for stolen e-rickshaws or components, citing lack of vehicle registration or documentation. Even in cases where complaints were registered, respondents noted that no follow up or recovery occurred reinforcing a perception of institutional neglect.

Motor and controller thefts though fewer resulted in complete work stoppage and high repair costs. Full e-rickshaw thefts were also reported, especially for unregistered vehicles, where police reportedly refused to register FIRs. In rare cases where insurance was available, compensation was received after months.

Overall, theft experiences underscores the lack of secure parking infrastructure, weak policing response and informal working conditions, which collectively expose e-rickshaw drivers to recurring financial shocks. These losses further aggravate indebtedness and income instability, reinforcing the need for designated e-rickshaw stands, secure parking facilities and stronger insurance awareness and enforcement mechanisms.

2.13. Incidence of Road Accidents among E-Rickshaw Drivers

Accident Reported	Number of Respondents	Percentage
Yes	32	45%
No	39	55%
Total	71	100%



Primary survey data shows that 45% of respondents (32 out of 71) reported having experienced at least one road accident while operating an e-rickshaw, while 55% reported no accidents. This indicates that nearly one in every two e-rickshaw drivers has been exposed to road safety risks, underscoring the hazardous nature of their daily work environment.

Qualitative accounts reveal that the most common form of accident was the e-rickshaw flipping over, particularly while taking turns, negotiating potholes or driving on uneven and poorly maintained roads. A significant number of accidents were attributed to road infrastructure failures, including potholes, waterlogged streets during the rainy season, broken MCD roads, sewage filled ditches, and hilly or inclined roads such as those in North Campus areas. Seasonal vulnerability was evident, with multiple respondents reporting accidents during monsoon conditions, when reduced visibility and slippery surfaces increased the likelihood of vehicle overturning.

Collisions with faster moving vehicles such as cars, trucks, buses, scooters, bikes, and app based taxis were another major cause. Several drivers reported being hit while turning or picking up passengers, often resulting in damage to windshields, headlights, batteries or controllers. In some cases, drivers were blamed by police regardless of fault, leading to informal payments or fines to release vehicles from police custody. One respondent reported paying ₹10,000 to the police to retrieve his e-rickshaw after an accident.

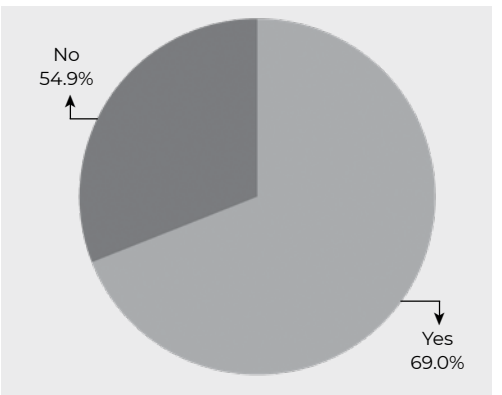
The consequences of accidents extended beyond vehicle damage. Some respondents suffered serious physical injuries, including long term hospitalisation (up-to six months) , extended loss of work and medical expenses running into ₹2,00,000 pushing households deeper into debt. Fatal outcomes were also reported, including the death of

a respondent's brother, an e-rickshaw driver only, his e-rickshaw was crushed between a truck and a bus on a major road.

Accident data highlights that e-rickshaw drivers operate in a high risk mobility environment, shaped by poor road infrastructure, lack of dedicated lanes, exposure to heavy traffic and weak institutional protection. These risks are compounded by inadequate enforcement of road safety norms, absence of vehicle design safeguards against overturning, limited post accident support from police and insurance companies. The findings strongly indicate the need for dedicated e-rickshaw lanes, improved road maintenance, monsoon proof infrastructure, and driver focused safety and insurance mechanisms to reduce accidents and protect livelihoods.

2.14. Incidence of Traffic Challans and Policing Actions against E-Rickshaw Drivers

Fined (Challan)	Number of Respondents	Percentage
Yes	49	69.00%
No	22	31.00%
Total	71	100%



The primary data reveals that 69% of e-rickshaw drivers (49 out of 71 respondents) have faced traffic challans, indicating a high level of regulatory interaction and penalisation within this informal transport sector. Only 31% reported never having been fined. This high incidence of challans highlights the structural vulnerability of e-rickshaw drivers within Delhi's urban traffic regime. According to official Delhi Police Traffic Police data for 2025 (January -June), authorities issued over 230,000 traffic challans specifically to e-rickshaw drivers for various violations. These include on the spot fines as well as camera based notices. (Business Standard 2025)

According to Delhi Traffic Police data made public through press reports, from **January 1 to June 15, 2025,** authorities issued **over 2,30,000 traffic challans** specifically to e-rickshaw drivers for traffic violations in the National Capital. These challans were issued for a range of offences including **improper or obstructive parking, violations of "No Entry" restrictions, driving without a valid licence, unauthorised persons driving,** and other regulatory breaches. Approximately **2,12,478 challans** were issued on the spot by traffic personnel, and **18,139 notices** were sent based on camera surveillance of violations. In addition, nearly **1,260 registered e-rickshaws were impounded** by traffic authorities during this period for serious offences.

The data also shows specific types of violations recorded by the Traffic Police:

Improper and obstructive parking — the most common offence recorded

Driving during restricted "No Entry" hours — over 30,000 challans

Driving without a licence — nearly 14,000 challans

Allowing unauthorised persons to operate the vehicle — more than 7,000 cases

Rustic Sign Board of "No Parking" Delhi Traffic Police

Obstructive or dangerous driving — over 4,600 violations

Operating without valid insurance or fitness certificates — several thousand cases

Nature of Challans Imposed

Analysis of qualitative responses shows that the most frequently reported challans are related to "No Entry" violations, followed by "No Parking, overloading, red light jumping, wrong side driving, U-Turn violations and documentation related issues (fitness, renewal, license). Among these *No Entry Challans* overwhelmingly dominate, particularly on arterial roads, highways, commercial zones, and areas such as Kashmere Gate, Delhi Cantt, Mundka, Nagloi, and major corridors.

Drivers repeatedly stated that route restrictions are poorly communicated, inadequately signposted, or abruptly enforced, leaving them vulnerable to penalisation despite relying on these routes for passengers' demand. Several respondents also mentioned that challans were issued outside showrooms when just buying the vehicle, while picking passengers, or while momentarily standing on the road, reflecting limited access to designated parking and stopping spaces for e-rickshaws.

A striking pattern in the data is the recurrence of challans for the same individuals. Many drivers reported being fined multiple times, ranging from 10-20 challans to extreme cases where drivers accumulated over 20 challans, with several still pending to file. This suggests not isolated violations, but a systemic mismatch between regulatory frameworks and the operational realities of e-rickshaw driving.

In some cases, drivers were unaware of challans issued through automated camera systems, only discovering them later. This lack of timely communication further aggravates the financial burden, as penalties accumulate with the late fees.

The economic impact of challans on e-rickshaw drivers is severe and disproportionate to their income levels. Reported challan amounts range from ₹ 100 - ₹ 1,000 for minor violations to ₹20,000 - ₹25,000 for No Entry or Red light jumping, with some drivers reporting total challan burdens of ₹ 70,000 - ₹ 80,000, ₹ 1-3 Lakh and in extreme cases even higher.

For drivers whose daily net earnings are modest and inconsistent, such fines represent months of income loss. Several respondents reported being unable to clear challans, resulting in pending penalties, legal stress, and risk of vehicle seizure. In certain instances challans were issued without clear explanations, reinforcing perceptions of arbitraries and harassment.

The challan data underscores the informal and precarious position of e-rickshaw drivers in the urban transport ecosystem. Despite contributing significantly to last mile connectivity, drivers face regulatory enforcement without commensurate infrastructural support, such as dedicated lanes, parking spaces or clearly demarcated permissible routes.

Moreover, enforcement practices appear punitive rather than corrective, with little emphasis on awareness, training or signage. The absence or grievance redressal mechanisms further compounds the problem, leaving drivers with limited avenues to contest or negotiate penalties.

The high incidence, repetition and monetary magnitude of challans indicate that traffic penalties function not merely as regulatory tools, but as a major source of economic insecurity for e-rickshaw drivers. Combined with long working hours, low and unstable incomes, theft and accident risks, challans significantly erode livelihood sustainability. The data calls for policy re-valuation including rationalisation of fine amounts, clever route regulations, designated infrastructure for e-rickshaws, and shift from punitive enforcement to inclusive urban mobility governance.

CHAPTER 3

Case Studies of the Respondents

Case Study 3.1 : Chote Lal, Delhi Cantonment

Theme: Pandemic Induced Livelihood Transition and Climate Precarity

Chote Lal, a 47 year old e-rickshaw driver, operates primarily around the Delhi Cantonment Metro Station, a location characterised by moderate but steady passenger demand. Originally from Devariya district in Uttar Pradesh, he migrated in 1988. He was earlier working in a factory in Delhi then the company shut during the time of COVID, but after sometime received the pending money from the company so he bought an e-rickshaw in 2021, since then he has been driving e-rickshaw. Coming from a working class background, his father was employed in a jute mill in Kolkata, indicating early exposure to wage labour and industrial work environments. Representing the reproduction of labour in the working class.

Interview of Chote Lal at Delhi Cantonment

Chote Lal has been engaged in e-rickshaw driving as his main occupation and earns around 18000/- ₹ per month and represents the large segment of migrant workers who sustain Delhi's last mile transport system. He works for 12 hours and most of his commute is from Delhi Cantt metro station to Delhi Cantt Railway Station and makes around 6-7 primary route cycles. His expenses which were recorded during the survey collection was around 12550/- ₹ per month. Salary income and expenses differ as full proof information was unreported.Despite being part of the city's electric mobility ecosystem, his work remains economically precarious.

During the course of his work, Chote Lal has faced road safety risks. He reported being involved in a road accident in which his e-rickshaw was hit by a car, resulting in damage to the vehicle's headlight. Although the accident caused financial loss, he did not receive any insurance compensation, highlighting gaps in insurance coverage and awareness among drivers. Additionally, he has experienced theft, including the loss of speaker fitted in his rickshaw, further adding to lack of security at the parking spaces shows an infrastructure problem.

When asked about the government's EV policy which also promises to make 25% EV sales by 2024 (Policy 1.0), with newer plans aiming for 95% new registrations by 2027 and 98% by 2030. He said he's only aware about the subsidy scheme which he availed

while purchasing e-rickshaw in 2021. But regarding the battery, he reported frequent battery- related problems such as reduced charging capacity, voltage drops, and shorter operational hours, especially during extreme temperatures. Weather conditions, particularly during the monsoon season, pose significant operational challenges for e-rickshaw drivers like Chote Lal. Heavy rainfall often leads to water seepage into critical components such as wiring, controllers, and battery terminals. Defect in motor and controller is a very occurring material in e-rickshaw. For the motor the repairing cost is around 1200 rupees and for the controller around 800 rupees which is a huge amount for the operators. His monthly expenses for the repair cost between 500 to 1000 rupees. According to the survey findings and Chote Lal's experience, exposure to water frequently results in short circuits, reduced battery efficiency, and sudden vehicle breakdowns, forcing drivers to stop operation till the repair.

These failures not only cause immediate income loss but also lead to additional repair expenses, which further strain already limited earnings. The lack of weather proofing in most e-rickshaw models and the absence of covered parking or charging facilities increase these issues. During prolonged rainy periods, drivers also face safety risks due to potholes and badly maintained roads in overall Delhi. He mentioned that badly maintained roads are very dangerous for the e-rickshaw because then it can quickly flip over and increase the likelihood of accidents. This highlights an infrastructure lack on public services too where climate resilient vehicle components and protected charging and parking species are essential to sustain e-rickshaw operation.

Overall, this case study highlights the broader survey findings: while e-rickshaws play a crucial role in Delhi's climate mitigation strategy, drivers remain economically vulnerable. Addressing battery quality, repair ecosystems, and daily cost burden is essential to ensure that the transition to electric mobility is not only environmentally sustainable but also socially equitable.

Case Study 3.2 : Babbu, Delhi Cantonment

Theme: Battery Swapping, Rising Operating Costs, and Livelihood Diversification

Babbu, a 30 year old e-rickshaw driver, operates primarily at Delhi cantonment metro station area. Very long and deep conversation with Babbu bhai. I met him at the Delhi Cantt metro station where he was calling for passengers. I asked him if I could take his survey. He said it's working time but I insisted after continuous rejection from others. I asked him if I could tag along with him on an E-Rickshaw and talk while driving. He agreed. Babbu bhai has been driving an E-Rickshaw for 15-16 years now. When asked about how he came into this occupation he said when he came to Delhi driving an e-rickshaw seemed like a better option to work on their own will and that time earning also used to happen much better than now. He also has interest in vlogging also, has brought go pro worth of 40,000 Rs and has been paying EMI for that. Originally from Gonda district in Uttar Pradesh, Babbu migrated to Delhi in search of stable income but based in Delhi as his wife and mother are living together with him. But he said he keeps visiting his village in UP. His family has land there for farming, so he has to go and look after it after a few months. While talking to him he received call from

Battery Swapping Station

loan agency they were asking for the monthly EMI which he did not fill of two months due to he went back to his village for land dispute. He also has school kids passengers daily fixed which he drops and picks from school to home. He said traffic police take money from every red light which E-Rickshaw is crossing daily and he also has to pay 1200 Rs monthly. Babbu drives an e-rickshaw operated though a battery swapping system (SWITCH Model). Instead of owning a battery, he exchanges depleted batteries at designated swapping centres. He said that nowadays many rickshaws have started coming with the switch battery. He has to pay a total of 250 Rs for the two times charge, one time charge for the day is 175 Rs and if the driver goes again for the charge it costs 75 Rs for the second round of charging. Usually these batteries on charge run 3-4 hours only if running it for 40-50 KM then the operator has to replace the dead battery with a working charge battery. In one day he said on average 3 times drivers have to change their battery if they are working for 12 hours, which costs 335 Rs total per day just for charging. He said that with this battery he doesn't have to wait long for charging, swapping batteries maximum takes 30 minutes. But this also raises an increased cost of battery charging in the city. The driver operates a smart battery connection, so he said he's not responsible for any defect. But when asked about how many times it had shown defects he said 5 to 6 times the battery had shown defect but changed at switch centre. He said it requires at least 7000 Rs for the new smart battery connection. But it also says that only 4 holidays a driver gets in a month, if they are not operating other than holidays then the driver would be fined 120 Rs.

Survey data indicate that Babbu's daily income is closely matched by daily expenses, leaving little room for savings. His routine expenditures include battery swapping charges, food, and minor maintenance in e-rickshaw. In addition to driving, when talking about the loan expenses he mentioned that he also brought go-pro for the vlogging, he has keen interest in video recording and films so he wants to start vlogging and sees that occupation as secondary earning in the household income. The loan of the camera also adds to his monthly expenditure. While vlogging offers a potential alternative income stream.

In terms of technical knowledge, Babbu has limited involvement in battery maintenance due to the centralized swapping system. Due to experience in driving e-rickshaw now, he can identify problems and can change wiring during short circuits, but depends on local mechanics for most repairs. Battery related issues are entirely managed by the swapping provider.

Weather conditions- especially during the monsoon season- significantly disrupt Babbu's operations. Heavy rainfall often remains unaffected. Waterlogged roads around metro stations break down risks and compromise safety. On days of intense rain, Babbu either works reduced hours or avoids operating altogether, resulting in no income.

Babbu's case illustrates the evolving nature of livelihoods within Delhi's electric mobility ecosystem. While e-rickshaws contribute to climate change mitigation by reducing tailpipe emissions, drivers like Babbu navigate economic precarity, climate vulnerability, and infrastructural gaps. His engagement in vlogging alongside e-rickshaw driving highlights emerging livelihood diversification strategies among urban informal workers, even as financial risks- such as loans and instability persist.

He suggested that E-Rickshaw should only be given to those who have license so that underage kids shouldn't drive E-Rickshaw and it will lessen the accidents in the area. He also mentioned another category which was to at least 5th class pass at least to acquire E-Rickshaw. He also suggested that E-Rickshaw drivers should get a stand so that they are not stopping here and there on roads where police exploit them for money.

Case Study 3.3 : Geeta Kumari, Punjabi Bagh West

Theme: Gendered Vulnerability and Informality in Electric Mobility

Geeta Kumari, 48 has been in the E-Rickshaw line for 8 years now. She's one of the oldest drivers at the Punjabi Bagh West Metro Stand. She never married anybody after asking the reason she simply said "man nahi kiya kabhi". She earlier used to own 2 E-rickshaws, one was seized by the transport authority because it was unregistered. Her other current rickshaw is also unregistered which she brought on down payment from the earlier owner of Rs 35,000; she had to pay money to traffic police to run on a road which is Rs 300/- Monthly. I met Geeta Kumari before also while doing the pilot for the survey and marked her for the detailed conversation, while asking about the indebtedness Geeta mentioned that 3 days ago only she borrowed 50,000 from somebody for the battery on 10% interest and have to pay 3000 Rs every month to get over the indebtedness. She also pays for her beema (insurance) which is 1000 rupees per month. While asking about the challan she said traffic police take money from every rickshaw and cut the challan afterwards. For parking and standing for everything, the police take money. But still around Rs 46,000 of no entry challans were on earlier vehicles during the lockdown time in 2021. All these challans were taken to Lokadalat and filled with limited waive off from the challans. She suffered a major accident while driving an e-rickshaw and had surgery in leg. Geeta suggested that there should be a separate stand of e-rickshaw for women drivers as they get trouble and overpower by the majority of male e-rickshaw drivers. She had to compete with the other men e-rickshaw drivers. Traffic police really trouble e-rickshaw drivers. She's the single person who looks after herself.

When asked about the difficulties while riding in different weather, she mentioned that passengers do not sit during the rainy season because of getting wrenched in rain, e-rickshaw is open from all sides. The motor and controller showed defects during the rainy season and repair cost range between Rs 800 -1000, once she told that she had to push the e-rickshaw to the mechanic as it stopped working only during rain. Rains are not very good for the e-rickshaw to run as during rain the motor gets the water from the overflowing roads and stops working. Many e-rickshaw drivers also suggested that

the motor and controller either should come waterproof or it be above in e-rickshaw where it does not get water.

Geeta Kumari reported being involved in a road accident while turning the vehicle e-rickshaw flipped over and the bike crashed with the e-rickshaw. The incident occurred on a busy road where mixed traffic conditions increased the chances of road accidents. She was admitted to hospital for 6 months and had an expenditure of 2,00,000. Although the accident did not result in permanent injury, it caused temporary disruption to her work and required time and resources for vehicle repair. The experience highlighted her vulnerability as an e-rickshaw driver in a traffic environment dominated by faster and heavier vehicles.

Repair Puncture sometimes in month, but not much repair because new vehicle. She mentioned that the rickshaw which she brought is just 6 months old so not much repair cost is there. She mentioned that even after she pays entry money to traffic police, she's being troubled and fined by the traffic police unnecessarily. Geeta Kumari is one of the few women's e-rickshaw drivers at the Punjabi Bagh Metro Station, she mentioned about the male dominance at the stand that sometimes she's being overpowered by the men drivers by not letting her take passengers and reported theft also from the stand.

Geeta Kumari experience underscores the need for gender sensitive EV policies, including access to affordable credit, reliable battery systems, fair enforcement mechanisms, and enhanced road safety measures to ensure that the transition to electric mobility is both environmentally sustainable and socially just.

A comparison with other case studies in this research highlights both shared and differentiated experiences among e-rickshaw drivers. Like Babbu, Geeta Kumari faces income loss during extreme weather, particularly in the monsoon, when safety concerns and component failures limit operations. However, Babbu's use of a battery swapping system reduces charging downtime, where Geeta Kumari experiences greater disruption due to battery related performance issues. In contrast, Chote Lal, who relies on charging from the parking space, faces higher long term maintenance and replacement costs, especially related to battery degradation.

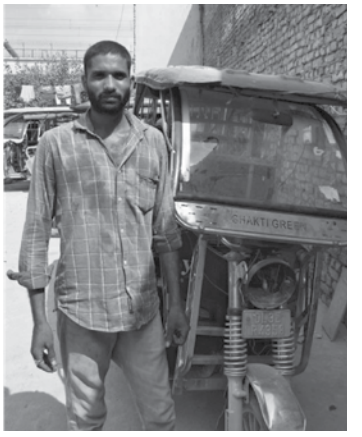
Across all three cases, summer heat and monsoon rains reduce working hours and increase operational risks. Geeta Kumari's experiences are further shaped by gendered safety concerns, which are less pronounced in the case of Babbu and Chote Lal. Together, these cases illustrate how battery type, infrastructure access, and social position shape vulnerability within Delhi's e-rickshaw ecosystem.

Case Study 3.4 : Shamun Ansari, Jamia Milia Islamia

Theme: Invisible Labour in the E-Rickshaw Ecosystem

While doing surveys at the Okhla Vihar, Jamia Milia Islamia area. I came across one parking lot where I met Shamun Ansari at the Okhla Vihar e-rickshaw parking. He's 22 years old and used to drive an e-rickshaw two years ago. Shamun Ansari represents a distinct occupational category within Delhi's e-rickshaw ecosystem. He left driving e-rickshaw as there was not much earning and joined as caretaker and mechanic at

the e-rickshaw parking. He's one of the people in the e-rickshaw occupation who supports daily operation through parking management and vehicle repair, rather than driving. Before driving an e-rickshaw he worked as a car mechanic for 6 years and later after leaving that job then he worked as an AC repair mechanic. Shamun Ansari has been working at the parking of an e-rickshaw for two months and gets around Rs 22,000. At the parking site, Shamun's responsibilities include organising vehicle parking, monitoring battery charging arrangements, and assisting drivers with minor repairs as brake adjustments, wiring issues, type punctures, and battery connections. His prior experience as a driver has equipped him with practical technical knowledge, allowing him to identify common faults quickly.



Shamun Ansari at parking workshop

After enquiring about the daily schedule he mentioned that he hardly gets any time to sleep due to busy schedule at the parking lot, because he had to put rickshaws for the charging that goes on till 1 am in the night. He also has to repair the rickshaw if there's any problem with that.

Shamun reported that weather conditions significantly affect parking and repair work. During monsoon season, waterlogging in parking areas increases the risk of electrical damage and corrosion, leading to high demand for repairs. He mentioned that nowadays parkings are functional in every area, there are mostly 3-4 parkings for e-rickshaws in just Okhla Vihar only, demands for space to park has increased as people don't have a place to park at their residential areas due to congestion. The lack of covered parking infrastructure also results in the problem in e-rickshaw as during the summer heat or winters with no covered space exacerbates these problems, affecting both vehicle longevity and driver earnings.

Although Shamun is no longer a driver, his work remains closely tied to the financial stability of e-rickshaw drivers. He observes that many drivers struggle with recurring repair cost which is in throttle change, wiring problem, inconsistent battery performance. When asked for the suggestions, he suggested several things which can be improved in E-Rickshaw : Controllers and Motors have to be set up from the ground level so that it does not get water. E-rickshaw have several cases of overturn for which he suggested that if the back tyres are a little bit on the outside and thick then the vehicle won't flip. As when he used to drive a rickshaw his rickshaw was also overturned. He mentioned that the *'Vande Bharat'* model e-rickshaw has a controller on the upper deck so that it secures it from the water problem. The parking lot which he works in, the owner owns around 17-18 rickshaws and they are all rented. Due to family responsibility he had to work here. Shamun Ansari belongs to Ghaziabad and his rickshaw income was not enough for family to look after. But he has an ambition to open up his own mechanic shop someday. He mentioned that 3000/- per month is the parking cost for the e-rickshaw whoever is parking there.

Shamun Ansari's case underscores the critical yet often overlooked role of parking operators and informal repair workers in sustaining Delhi's e-rickshaw scenario. While policy frameworks largely focus on drivers and vehicles, daily operations depend heavily on accessible parking spaces, basic charging arrangements, and on the spot repair services. The absence of designated, weather- protected parking areas increases the risk of electrical damage during monsoons and battery overheating during summers, leading to frequent breakdowns and burden on drivers. Informal repair workers bridge gaps left by formal service centres, but their work remains unregulated and unsupported. With less income and more than 12 hours of work with laws to govern makes parking mechanics more insecure about their work.

Strengthening e-rickshaw infrastructure through planned parking hubs, covered charging facilities, technical training, and recognition of repair workers can significantly improve vehicle lifespan, mechanic and driver livelihoods, and overall resilience of electric mobility systems in Delhi.

Case study 3.5 : Rashida Begum, Dilshad Garden

Theme: Female Breadwinning, Safety and Technological Transition

Dilshad Garden metro station is a very busy metro station as passenger overflow is high during the whole day. At the metro station, 4-5 cycle rickshaws are also present and around 20-30 e-rickshaws are functioning from Dilshad Garden metro station. From here the commuters go to DLF in Ghaziabad, Shalimar Garden. For both the locations there's a different queue of e-rickshaws. I met Rashida Begum at the Dilshad Garden metro station while doing the data collection. Rashida Begum earns around Rs 20,000 per month out of e-rickshaw, her younger son also works in a chicken shop in Seemapuri and earns around 10,000 per month. She has 7 people to look after in her family. She has been driving an e-rickshaw for 8-9 years now. Runs from Dilshad Metro station to DLF, Ghaziabad. Her husband died early from when she started earning. Earlier before joining e-rickshaw occupation she used to have an egg cart in Vaishali but it was also moved then 9 years ago. Left with employment, as she thought that in E-rickshaw earning would be stable and profitable. Her entry into the e-rickshaw secretary was shaped by the need for a reliable source of income to support household responsibilities, making e-rickshaw driving a crucial livelihood option. She mentioned that E-Rickshaw has provided her employment but now e-rickshaw numbers have increased and earning is less.

She mentioned that people whose under e-rickshaw is registered only should be riding e-rickshaw, as e-rickshaw numbers are increasing with an unregulated machinery to look after. When asked about the e-rickshaw loan and other loans, she mentioned clearly that I don't take things on loan, its very bad habit. On down payment she bought the E-rickshaw in 2024 for Rs 1,65,000. Rashida mentioned that so far there's no problem in her battery as battery and rickshaw are both new. She uses Lithium Ion battery in rickshaw which is a general trend battery in e-rickshaw. But earlier before this rickshaw, many problems came in the battery. She earlier used an acid led battery which expires every one year and a new battery can be purchased with Rs 10,000 subsidy

from the earlier one. Lithium Ion batteries have a life of around 3 years, between 2-3 years battery backup decreases but no subsidy if lithium ion batteries expire then it is sold at a kilogram price or either company people take it away.

Most of the e-rickshaws are flipped over while riding, Rashida Begum has also faced accident once when she was turning the vehicle on u-turn her e-rickshaw flipped over and she suffered injuries. The company does not guarantee the e-rickshaw flipping over but still most of the e-rickshaws have suffered accidents because of bad quality parts and body of the e-rickshaw.

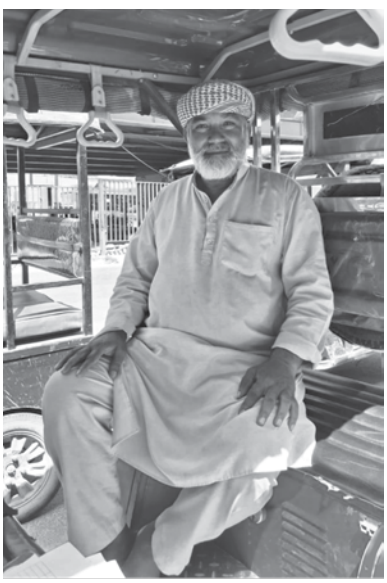
Seasonal weather conditions significantly influence her ability to work. In the monsoon season waterlogging on roads damages e-rickshaw throttle, motor and controller which increases her repair budget every season. Most of the time she wraps plastic polythene on throttle to save it from getting wet.

She also mentioned that only people who have a license should be allowed to drive e-rickshaw because a lot of accidents nowadays happen due to which all e-rickshaw communities face backlash. She mentioned that her home lane is very narrow so that's why she has to park at the parking lot. She also mentioned that in this it is mostly dominated by the men, being as a woman she has to be very assertive with her work and schedule otherwise she will be sidelined. She's among the only few women who drives e-rickshaw at the Dilshad Garden. The e-rickshaw also provides employment opportunities for the people like Rashida but the government also has to ensure their safety while riding and provide them with better working conditions.

Case Study 3.6 : Sher Mohammed, Dilshad Garden

Theme: Ageing Workers, Health Constraints, and Moral Economies of Labour

Sher Mohammed is a 62 year old e-rickshaw driver residing in New Seemapuri, East Delhi. He is Delhi born, originally from Sewa Nagar, Kotla Mubarakpur and belongs to the Bhisti community. Coming from a family engaged in informal work- his father was a vegetable seller at the ITO. Sher Mohammed also was a vegetable vendor but he left that work because of back pain and started driving an e-rickshaw. It's been around 10 years now he has been driving an e-rickshaw. At his age, e-rickshaw driving remains his primary source of income despite physical strain.



Sher Mohammed

He told me an interesting incident, during 1997 a school bus full of students fell in Yamuna near Wazirabad bridge. He happened to be there at the moment taking his cart for the fresh vegetables in the morning. As soon as he saw the accident he jumped in Yamuna with his cart and saved at least 30 school kids' lives. He seemed really proud about it. He said he was nominated for the Jeevan Rakshak

Award and cash reward from the Delhi government but he did not get anything from the government. He also blames communal politics for not getting him the proper recognition. He even mentioned that he was even questioned by the CBI and police regarding his intention behind saving the kids' lives. Other than exploitation he mentioned he did not get anything from the government. He has a family of 5 to look after him, his one daughter aspires to be lawyer but due to her psychological problem she is not able to continue her studies, Sher Mohammed's mostly earning goes to his daughter's treatment only, leaving little scope for savings. This aligns with broader survey findings that e-rickshaw drivers operate under tight income-expenditure margins, particularly older drivers with limited alternative employment options.

He said repair expenses do not come monthly, but every 2-3 months a big repair is always scheduled and its cost would range from 500-1000 Rs, usually maintenance required in wielding, wiring, throttle change. He mentioned in repair that the bearing of the tyre needs to be changed after every 2-3 months and that requires 4000 atleast. When asked about the lithium battery disposing he said that the company takes the dead batteries to their warehouse, e-rickshaw drivers don't know much about the disposing of batteries, and the company takes the responsibility of disposing the batteries.

With the changing weather he wraps polythene around the throttle because usually the throttle gets spoiled due to rain. Motor and controller also face problems during the rainy season. Usually he stops riding during the time of monsoon to safeguard his vehicle and save his repair cost on motor and controller.

He had not been in any accident but mentioned that once snatchers snatched a passenger phone from the running rickshaw. He is one of the oldest members at the stand and has a respected personality among the other rickshaw drivers. He suggested that e-rickshaw should have a pressure brake, the brake of the vehicle is very loose. A driver should not be intoxicated while driving an e-rickshaw. Traffic police shouldn't trouble unnecessarily and no heavy challans should be there on e-rickshaw.

Case Study 3.7 : Bablu, Model Town Phase-1

Theme: Disability, Adaptive Innovation and Exclusion in EV Design

Bablu is a 40 year old r-rickshaw driver residing in Model Town Phase - 1, North Delhi. He mostly operates from Model Town Metro station to GTB Nagar, Gurudwara Model Town. Originally migrated from Bihar. His father, Late Pelo Chaudhary, was engaged as a manual labourer, indicating a background rooted in informal and physically intensive work. Bablu's livelihood trajectory reflects continuity within the informal labour economy, now shaped by electric mobility.

A defining aspect of Bablu's case is his physical disability. He has a disability in his right leg but it doesn't affect his ability to operate e-rickshaw. He has modified the brake shoe mechanism of his e-rickshaw to suit his physical needs. This adaptive modification allows him to control braking safely and continue operating the vehicle independently. His case demonstrates how drivers innovate informally to remain economically active in the absence of disability inclusive vehicle design.

Bablu depends on e-rickshaw driving as his primary source of income. He reported monthly 10,000 Rs as his income, it might be an unreported income but shows less income on average through which e-rickshaw drivers sustain their livelihood. His earnings follow a daily income - daily expenditure pattern, leaving limited scope for savings. Bablu drives a rented e-rickshaw, rent amount is 350 Rs per day excluding the cost of charging and parking which is 80 Rs and 70 Rs respectively per day. He has been driving an e-rickshaw for three years now. That amount is around 19500 Rs so the income has to be more but couldn't make the interpretation. But it also leaves a very limited scope for savings. He has a family of 3 to look after, has a 6 years old son and wife which are dependent on him. He mentioned that he doesn't have to pay entry monthly money to traffic police as other e-rickshaw drivers at Model Town metro station pays, he gets a relaxation from the police. Entry to the police also felt very mandatory for the e-rickshaw drivers to run on the road but that's just a domination of the police it has no relation with the law.

Modified Brake Shoe

He does not own a license and can't make a license due to his disability. E-Rickshaw is registered on his wife's name. Bablu's case is particularly important in the context of inclusive climate transitions. He mentioned that during winters e-rickshaw drivers face problems because passengers hardly sit on e-rickshaw often because it is open from all sides. He also blamed that AC buses which the government has started have also taken their passengers so people do not feel cold in buses, but that cannot be the reason why e-rickshaw are not able to earn properly. Change has to come in E-Rickshaw's policy and the way it is manufactured.

When enquired about the battery defect if he has ever faced any problem in battery, Bablu reported that he has not experienced any battery related defects to date, which he attributes to careful handling and preventive maintenance. His statement that he "does not let the battery develop defects" reflects a proactive approach to battery management, including cautious driving, timely charging, and avoidance of practices that could damage battery health. But maintenance and proactiveness does not matter much when after some years the battery automatically starts showing a defect, between 2-3 years battery has a defect, this should be increased otherwise e-rickshaw drivers will keep facing issues and financial burden.

While e-rickshaw are promoted as environmentally sustainable transport options, existing designs and infrastructure do not adequately account for drivers with physical disabilities. Bablu's self-initiated modification of the brake system points to both resilience and systemic neglect.

When asked about the challans, he said nowadays traffic police does not interact with the operators much, interaction also creates an opportunity for drivers to present their case, but nowadays traffic police clicks photos of number plates and challan comes on phone. Bablu is not aware about any challans which have been fined on his name

but he said there might be one or two of 'no entry'.

The case underscores the urgent need for disability -inclusive policies, including adaptive vehicle design, license to disabled people, financial support for modifications, accessible repair services and recognition of drivers with disabilities as legitimate stakeholders in Delhi's electric mobility transition. Without such measures, the shift toward clean transport risks excluding some of the most vulnerable workers within the system.

Case Study 3.8 : Rajkumar, Harkesh Nagar Okhla

Theme: Collective Organisation and Resistance in Informal Mobility

Rajkumar

I got to know during the pilot survey for the E-Rickshaw driver that there's an association of drivers which is working in the Harkesh Nagar Okhla area. In the past also they have been active with the various issues which are present in the sector. I went to Harkesh Nagar Okhla metro station and contacted Rajkumar ji for further discussion. Rajkumar ji with a smile on his face came to pick me up at Harkesh Nagar Okhla metro station. He was very happy that somebody outside of their organisation is working on E-Rickshaw issues. Rajkumar ji age 48 years old has been driving an e-rickshaw for 8 years now since 2017. Earlier before the e-rickshaw occupation he used to work in a flour mill and worked for more than 20 years there and had to leave due to less salary and work exploitation. In 2017, he brought his own e-rickshaw for Rs 1,35,000 with a down payment, which was comparatively low compared to present amount.

Rajkumar is associated with the 'South Delhi E-Rickshaw Association', this association is formed together by Rajkumar and Mahendra Prasad, who's currently an Secretary of the Association was also interviewed later. South Delhi E-Rickshaw Association is an active association of E-Rickshaw drivers based or driven in Harkesh Nagar, Okhla, Govindpuri and adjacent areas. Currently they have 25 e-rickshaw drivers under the Association. They have a monthly membership of 100 Rs, when asked about the membership fees he mentioned other than membership amount they don't have any other funding source for the programs such as memorandum submission at the Transport Inspector, protest at the transport department. The association functions independently.

The association has fought a case against the DMRC for only giving special permission to certain model e-rickshaw to park and take the passengers from the Harkesh Nagar metro complex and other e-rickshaw drivers were not allowed inside the complex. They had to take the passengers from the road only. So this rule has created a conflict among the e-rickshaw drivers. Because those e-rickshaws which are parked outside the metro complex couldn't get any passengers to carry, so South Delhi E-Rickshaw

Association filed a case against the DMRC for doing the selective bias, case went on for sometime and resulted in no rickshaws being allowed inside the complex. Now, all e-rickshaws have to park outside the complex and get passengers.

South Delhi E-Rickshaw Association also works for the betterment of e-rickshaw drivers and against the brutalisation and exploitation by the authorities. Rajkumar mentioned that e-rickshaw drivers have to pay 800-1000 Rs to traffic police as entry money on road which is not the rule, it's an direct extortion of money, Rajkumar said assertively why don't every e-rickshaw driver become part of Association and does not give money to traffic police. Association provides a collective strength. He suggested that charging and parking for the e-rickshaw drivers should be provided by the government as government charging stations are not enough and does not have an infrastructure to park e-rickshaws. He also said basic facility such as water for the e-rickshaw drivers also lack, they have to spend money on buying water once their own bottle get finished. Their also not stand for the e-rickshaw drivers that's why also they have to park on road and becomes prey of heavy challans by police.

Rajkumar's experience reflects broader structural challenges faced by e-rickshaw drivers in South Delhi. According to survey insights, enforcement related uncertainty such as inconsistent challans, lack of designated e-rickshaw stands and restrictions on movement in certain zones remains a persistent concern. Association level engagement becomes crucial in negotiating space for e-rickshaws within planned urban areas, where informal transport is often viewed as an inconvenience rather than essential service.

From a climate and mobility perspective, Rajkumar emphasises that e-rickshaws are not only a source of livelihood but also a critical component of last mile connectivity and low emission transport. However, he points out that without institutional recognition of associations, drivers continue to face fragmented governance and uneven implementation of EV policies.

Rajkumar's case illustrates the importance of collective organisation within the electric mobility transition. While policy frameworks focus on vehicles and technology, associations like South Delhi E-Rickshaw Association play a key role in translating policy into practice, protecting drivers interests, and sustaining everyday operations. Strengthening such associations through formal consultation, capacity building and recognition could significantly improve the effectiveness and equity of Delhi's clean transport transition.

Case Study 3.9 : Rizwan Alam, Noor Nagar

Theme: Dual Employment and the Limits of Green Mobility (Just Transition Lens)

I met Rizwan Alam at Noor Nagar, Delhi. Rizwan Alam is a 48 year old e-rickshaw driver residing in Noor Nagar, South Delhi. He was born in Aara, Bihar, and migrated to Delhi in search of livelihood opportunities. Rizwan Alam has been driving for 19 years now. He's one of the oldest people I met during the field survey who has been driving for this long. Rizwan Alam currently lives with his household members in Noor Nagar, in his family there are 8 people including Rizwan Alam. His elder son is also working in Jindal Power Plant as supervisor and contributes to household expenditure. Only two

people in his family earn. Rizwan Alam does two jobs, he drives an e-rickshaw for 4 hours and then he works in MCD as a guard. From the e-rickshaw his average income is Rs 16000 and from MCD job his salary is around Rs 15000. His son's monthly income is Rs 12000. Average household income ranges between Rs 40000-45000. He said he has to do two jobs at a time to financially stable the household situation. One of Rizwan's daughters in the house has a disability from 3 years of age so her treatment requires a lot of money to get better. He has brought his own e-rickshaw, it cost around Rs 2,32,000 with an interest rate of 25% on EMI. He mentioned that his monthly expenses for the e-rickshaw cost around Rs 3000. He said if he goes to the mechanic for any repair minimum expenditure would not be less than Rs 500. His e-rickshaw battery stopped working after 6 years, it was a lithium battery, as there was no guarantee he had to buy a new battery.

During the monsoon season, he mentioned that most problems occur in motors and controllers that require at least Rs 1000 for the repair. When asked about the challans on his e-rickshaw, he mentioned that he was fined Rs 35,000 when he used to drive rented e-rickshaw for no entry, no parking he later went to lokadalat till fill the challan, Rs 5000 was waived and Rs 30000 was filled for the challan, both owner and driver paid half amount. Challans are the biggest burden on e-rickshaw drivers. Because most of the time there's no sign of 'no entry' which stops e-rickshaw drivers to not drive on that road and when police tell them about no entry e-rickshaw drivers don't have any other option than accepting the challan. After owning the e-rickshaw there's no challan till yet, but police have stopped him on the road but didn't file the challan.

Despite these challenges, Rizwan Alam is aware of government EV policies, particularly subsidy schemes but reported that he has not benefited from any government support. This gap between policy awareness and actual benefit reflects a broader pattern observed across the survey. He mentioned about the difficulties during the winter season, hardly passengers sit due to cold weather and winter also affect his labour potential. But e-rickshaws are one of the important components for last mile connectivity.

Rizwan Alam's engagement in two forms of work, operating an e-rickshaw and working as guard under the Municipal Corporation of Delhi (MCD) illustrates the adaptive livelihood strategies adopted by informal workers in response to economic insecurity. Rather than reflecting upward mobility, this dual employment indicates the insufficiency of income from a single occupation to meet the household needs. He first joined an MCD job and then later started driving an e-rickshaw. The form of livelihood diversification highlights the blurred boundary between formal and informal employment. Although the MCD guard role is associated with a state institution, it often remains contractual and low paid, lacking long term security or comprehensive benefits. Rizwan's case shows how workers navigate between informal self employment and semi formal wage labour to sustain economic survival.

From a policy perspective, the necessity of holding multiple jobs reveals structural gaps in both sectors. It underscores the need for improved income security, social protection, and labour rights within the electric mobility ecosystem. Without such

measures, climate friendly transport work risks reinforcing precarious labour conditions, compelling workers to stretch their physical capacity across multiple occupations rather than benefitting from the promised stability of green transitions.

Just transition

Rizwan Alam's engagement in dual occupations working as an e-rickshaw driver alongside employment as a guard with the MCD reflects broader structural dynamics in the shift toward low carbon mobility and informal work in urban India. From a just transition perspective, his need to balance multiple jobs indicates that the transition to low emission transport has not been accompanied by commensurate improvements in economic security, decent work and social protection for frontline workers (Newell & Mulvaney, 2013; Heffon & McCauley, 2018).

While e-rickshaws are promoted as climate friendly alternatives and integral to India's electric mobility (Ministry of Road Transport & Highway, 2014), the livelihoods anchored in them remain unstable. E-Rickshaw driving is characterised by variable daily income, weather alternatives, technical downtime, and limited access to institutional support conditions emblematic of informal labour (Chen, 2012; International Labour Organisation, 2018), The addition of second job such as municipal guard work serves not as a marker of upward mobility but as a livelihood diversification strategy necessitated by economic precarity (Ellis, 1998; Standing, 2011)

From the Just Transition standpoint, climate mitigation must address both environmentally and social justice outcomes (UNFCC, 2015; Newell et al., 2021). Rizwans's case illustrates that while policies may succeed in promoting e-rickshaw adoption, they fall short in ensuring protected, predictable incomes or access to social security and workplace protections that are core to Just Transition principles. The absence of accident insurance, lack of access to credit or subsidies and continued dependence on informal repair and enforcement interactions depict a transition that is only partially realised, a transition that reduces emissions but not precarious labour conditions.

A truly just transition requires that climate and transport policy be integrated with labour rights, universal social protectionism and inclusive support mechanisms for those most exposed to both economic and climatic risks. Rizwan Alam's experience underlines the urgent need for such integrated policy design; the benefits of a cleaner mobility system come at the expense of worker welfare.

Case Study 3.10 : Mohd Zahid, Kirari

Theme: High Risk Mobility, Informal Policing and Infrastructure Violence

Mohd Jahid, a 32 year old e-rickshaw driver residing in Kirari, Delhi represents the lived realities of informal electric mobility workers operating in high risk urban transport environments. Born in Patel Nagar, Delhi and belonging to the Ansari community, Jahid entered e-rickshaw driving as a primary livelihood source in the absence of stable formal employment opportunities.

Mohd Jahid drives an e-rickshaw which he rented 3 months ago. Jahid's monthly is around Rs 20000 and expenditure calculated came around Rs 22400. He drives an e-rickshaw for 16 hours and usually functions from Peeragrahi Metro Station to Nagloi, Udyog Nagar and other adjacent areas. Jahid's daily earnings from e-rickshaw operations fluctuate considerably and no longer show proportional growth with increased working hours. He mentioned that the e-rickshaw requires a lot of maintenance every month, break shoes and throttle is the component which gets changed every month or two. He said that he does most of the maintenance he does by himself which also saves him the cost to go to the mechanic. Daily expenditure includes charging costs, minor repairs, food and informal parking payments, he also charges his vehicle at the parking which is 100 Rs for both and rent for e-rickshaw is 430 Rs. He also has a loan of jewellery of 30,000 which he pays back every month. This reflects a broader trend in Delhi where increasing competition and regulatory pressures have reduced profitability for e-rickshaw drivers. Jahid reported no major recurring battery defects but emphasized that battery mileage remains insufficient, limited daily trips and income potential. He also experienced theft of the motor and controller from the e-rickshaw, no report was written in the police station, this also indicates a vulnerability to asset loss and neglect of authorities on e-rickshaw drivers. During the monsoon season, technical risks intensify; water ingress frequently affects the motor and controller, causing breakdowns and forcing drivers to suspend operations. Jahid stressed the urgent need for waterproof motors and controllers to ensure safety and continuity of work during rains. He also mentioned that during the rainy season passenger flow is less, hardly any income happens. At Nagloi and Peeragarhi metro station the condition of the road is really bad which affects the e-rickshaw body and bad roads result in more maintenance.

Stickers on E-Rickshaw which signifies "No Entry" Bribe to Traffic Police

Although Jahid himself has not faced an accident, his brother, also an e-rickshaw driver, lost his life in a road accident involving heavy vehicles. This personal tragedy strongly shapes Jahid's policy suggestions. He advocates for restricting truck movement during afternoon hours or creating dedicated e-rickshaw lanes to reduce fatal collisions. His father received the insurance money from his brother's accident after 5 months of process. Jahid e-rickshaw was once detained for overloading but released without a fine but he had to pay a bribe to crane service of traffic police to get it released from the station. He gives Rs 500 monthly to traffic police for the no entry road, as the road which he functions on is National Highway road on which e-rickshaws are not allowed to function but how would e-rickshaw drivers earn if they are not running on main road? asked Mohd Jahid. I also got to know an interesting way traffic

police extort money from the e-rickshaw drivers, Traffic police doesn't take money directly from the drivers so drivers had to go to shop which sells accessories for the e-rickshaw, they have to by stickers from the shop and give them the entry money directly, in case of Jahid Rs 500 monthly, then shop operator give the share to traffic police personnel. Informal stickers, often functioning as unofficial payments linked to policing, remain a routine burden.

Jahid is aware of government EV policies and subsidy schemes but has not directly benefited from the schemes, as he mentioned that he hasn't been able to brought e-rickshaw only to avail subsidy. He strongly recommends the establishment of designated e-rickshaw stands near metro stations, improved battery technology, and safer road infrastructure. His experience underscores that climate friendly transport must be paired with road safety, labour protection, and Just Transition principles, ensuring that workers do not bear the social costs of green mobility alone.

CHAPTER 4

E-Rickshaw Drivers: Informality, Labour Precarity and Urban Governance

4.1 Introduction

This chapter synthesises findings from fourteen visual representations - pie charts and comparative graphs derived from primary quantitative and qualitative data collected from e-rickshaw drivers in the National Capital Territory (NCT) of Delhi. Moving beyond descriptive statistics, the chapter situates the empirical findings within broader debates in urban studies, labour informality, and climate just mobility. It argues that while e-rickshaws are promoted as environmentally sustainable and inclusive transport solutions, the socio-economic realities of drivers reveal deep seated structural vulnerabilities rooted in informality, regulatory exclusion and labour precarity.

4.2 Socio – Demographic Profile and Structural Marginality

The respondent profile highlights the structural positioning of e-rickshaw drivers within the urban informal economy. The overwhelming male dominance (97.2%) reflects gendered access to urban mobility work, shaped by safety concerns, patriarchal norms, and unequal control over public space, an observation consistent with feminist urban studies literature (Phadke et al., 2011).

Religious composition shows a concentration of Hindu (71.8%) and Muslim (26.8%) respondents, which broadly mirrors the working class religious demography of many urban informal sectors. Religious and caste composition further situates e-rickshaw driving as an occupation largely accessed by working class and historically marginalised communities, particularly OBC and SC groups. As Breman (2016) argues, informal urban labour markets in India absorb surplus labour excluded from formal employment, reproducing social hierarchies rather than dismantling them.

4.3 Education, Skill Mismatch and Intergenerational Vulnerability

Educational attainment among respondents is notably low. A majority (57.7%) have studied less than high school, while additional 14.1% are illiterate. Only 2.8% are graduates and these are no respondents with diploma or postgraduate qualifications. This educational profile reflects both early school dropouts and limited access to higher education, often driven by poverty, migration, family responsibilities, and the need to enter the workforce at a young age. Educational data reveals persistently low attainment: a majority of drivers have studied below high school level, with negligible representation of graduates and none with diploma or postgraduate qualifications. Importantly, even respondents with secondary or graduate education reported unemployment or underemployment prior to entering e-rickshaw driving.

This reflects what Kallebery (2009) describes as “precarious employment pathways”, where education no longer guarantees stable work. The intergenerational educational pattern observed among family members suggests a reproduction of disadvantage, driven by economic insecurity, early workforce entry, and limited access to quality institutions. E-Rickshaw driving thus emerges not as a choice but as fallback livelihood in the absence of dignified employment options.

4.4 Ownership, Debt, and Financialisation of Informal Labour

Among vehicle owners, financing patterns show heavy reliance on formal loans (around 60%) followed by down payments (nearly 30%) with a smaller share depending on informals loans. Ownership patterns reveal a heavy reliance on formal loans and down payments, indicating partial financial inclusion. However, this inclusion is debt led rather than protective. As drivers shoulder loan repayments alongside volatile earnings, vehicle ownership becomes a mechanism of what Standing (2011) terms “self exploitation”, where workers absorb market risks individually.

Debt obligations, combined with maintenance costs, battery replacement, and challans, push drivers into chronic indebtedness. This reflects broader processes of financialisation of informal labour, where credit substitutes for income security without offering social protection (Guerin et al., 2015).

4.5 Working Hours, Income and the Limits of Labour

The hours of employment chart reveals labour intensity:

- 43.7% work 11-12 hours daily
- 28.2% work 9-10 hours
- 8.5% work more than 12 hours

Analysis of working hours shows extreme labour intensifies, with nearly 80% of drivers working over nine hours daily. Yet, income data demonstrates that longer hours do not translate into proportional earnings. The income expenditure curves show persistent deficits, where expenditure consistently meets or exceeds income even at peak working hours.

The decoupling of effort and reward aligns with labour studies in informality, where the absence of minimum wage enforcement, collective bargaining, and employment contracts leads to high labour input with low economic returns (Chen, 2012). E-Rickshaw drivers thus experience what Harvey (2010) describes as “accumulation by dispossession”, where urban systems extract value from labour without ensuring livelihood security.

4.6 Risk, Accidents and Urban Infrastructure Failure

Accident data shows that 45.1% of respondents have experienced road accidents, a significantly high propagation. Qualitative responses point to recurring causes:

- Poor road conditions and potholes
- Vehicle instability during turns

- Overcrowded roads and mixed traffic
- Rainy season hazards
- Collisions caused by larger vehicles (cars, buses, trucks)

Nearly half of respondents reported experiencing road accidents, frequently linked to potholes, poor road design, mixed traffic flows, and seasonal weather hazards. The disproportionate exposure of e-rickshaw drivers to these risks reflects the unequal distribution of urban vulnerability. Unlike private car users, e-rickshaw drivers spend extended hours on the road, operate slower vehicles within high speed mixed traffic, and lack protective vehicle infrastructure. Moreover, their routes are concentrated in congested, poorly maintained local roads rather than regulated arterial corridors. As a result, infrastructural deficiencies and traffic disorder translate more directly into physical injury and income loss for this occupational group.

Polythene Wrapped around handle which includes throttle

4.7 E-Rickshaws, Climate Policy, and Labour Blind Spots

While e-rickshaw contribute to emission reduction and last mile connectivity, the findings expose a critical blind spot in climate and EV policy: the labour conditions of green mobility workers. Climate friendly technologies, when embedded in informal labour markets protections, risk reproducing social inequality (Newell et al., 2021).

Thus, the study challenges techno-centric sustainability narratives and argues for a climate just mobility framework, where environmental benefits are aligned with labour rights and social security.

CHAPTER 5

Towards Climate-Just and Labour: Inclusive E-Rickshaw Governance in Delhi Policy Recommendation

E-Rickshaws have emerged as a critical component of Delhi's urban transport system, providing affordable last mile connectivity while contributing to reduced emissions in the transport sector. Promoted under electric vehicle (EV) and climate mitigation frameworks, e-rickshaws are often framed as a "green" and inclusive mobility solution. However, evidence from primary field research with e-rickshaw drivers in the National Capital Territory (NCT) of Delhi reveals a significant gap between policy intent and lived reality.

This policy brief draws on quantitative and qualitative data including income-expenditure trends, working hours, accident and theft experiences, policing interactions, and socio educational profiles to highlight the structural vulnerabilities faced by e-rickshaw drivers. It argues that without labour protections and inclusive urban governance, the environmental promise of e-rickshaws remains socially incomplete.

Policy Implications

The findings indicate that e-rickshaws cannot be governed solely as vehicles or environmental assets. They must be addressed as part of the urban informal labour economy. Failure to integrate labour rights, safety, and social protection into EV policy risks reinforcing inequality under the banner of sustainability.

Policy Recommendations

1. Recognise E-Rickshaw Drivers as Urban Transport Workers
   - Formally recognise e-rickshaw drivers within urban transport and labour policy frameworks
   - Extend access to social security schemes, including health insurance, accident coverage and old age pensions
2. Income Security and Labour Protection
   - Introduce minimum daily or monthly earning benchmarks for e-rickshaw drivers
   - Explore income-stablisation mechanisms during low demand periods or weather disruptions
   - Ensure inclusion of e-rickshaw drivers under urban worker welfare boards
3. Reform Traffic Enforcement Practices
   - Rationalise challan amounts in proportion to income levels of e-rickshaw drivers.

- Improve signage and clearly demarcate permissible routes for e-rickshaws
- Bans on e-rickshaws on 236 public roads should be again reconsidered
- Establish grievance redressal mechanisms for challans and enforcement disputes
- Mandate FIR registration for theft of e-rickshaws and related components

4. Safer and Inclusive Urban Infrastructure
   - Create dedicated e-rickshaw lanes and stands at metro stations, markets, hospitals, and residential hubs
   - Improve road maintenance in high e-rickshaw usage corridors
   - Ensure weather resilient vehicle standards, including waterproof motors and controllers
5. Financial and Technological Support
   - Provide subsidized battery replacement and affordable charging infrastructure
   - Design low interest, income linked loan repayments systems
   - Offer training in basic vehicle maintenance, safety and regulatory awareness
6. Gender-Inclusive Mobility Policies
   - Introduce targeted incentives, safety measures and training programs to encourage women's participation in e-rickshaw driving
   - Address social and infrastructural barriers limiting women's entry into the sector
7. Integrate Labour into Climate Policy
   - Embed labour rights and livelihood security within EV and climate mitigation policies
   - Adopt a climate just mobility framework that balances emission reduction with social equity

E-Rickshaws represent a critical opportunity to align urban mobility with climate goals. However, this study demonstrates that without labour inclusive governance, e-rickshaw driving remains a livelihood of last resort marked by long hours, economic insecurity and regulatory vulnerability. A truly sustainable urban transport transition must centre not only on cleaner technologies, but also on the dignity, safety and rights of the workers who power the city's mobility system.

CHAPTER 6

Conclusion

This study set out to examine e-rickshaws in NCT Delhi not merely as a technological intervention for cleaner urban transport, but as a labour intensive livelihood system embedded within the informal urban economy. By synthesizing fourteen visual datasets with qualitative narratives, the research demonstrates that e-rickshaw driving occupies a contradictory position: it is simultaneously celebrated in policy discourse as an environmentally sustainable mobility solution and experienced in practice as precarious, insecure and risk laden occupation.

The findings reveal that e-rickshaw drivers operate under conditions of persistent economic vulnerability. Long working hours often exceed ten to twelve hours per day which does not guarantee income stability or upward mobility. Instead drivers confront an income -expenditure imbalance characterized by rigid and escalating costs related to vehicle maintenance, battery replacement, loan repayments, challans, and household needs. The income expenditure curve clearly illustrates that increased labour input fails to produce proportional economic returns, reinforcing the argument that informal self-employment often functions as survival rather than productive entrepreneurship.

Education and skill acquisition, commonly framed as pathways to social mobility, offer limited protection in this context. The study highlights widespread educational disadvantage among drivers and their families, alongside evidence of unemployment or underemployment even among those with secondary or graduate education. This disconnect reflects broader structural failures in urban labour markets, where economic growth has not translated into adequate employment opportunities. Consequently, e-rickshaw driving becomes a default livelihood option in the absence of dignified alternatives, perpetuating intergenerational precarity.

The research also foregrounds the unequal distribution of urban risk. High rates of road accidents, theft, and exposure to unsafe infrastructure underscores how informal transport workers bear the costs of inadequate urban planning. Poor road conditions, lack of dedicated lanes, and absence of safe parking spaces amplify physical danger and financial loss. These risks are further compounded by policing practices that disproportionately penalise e-rickshaw drivers through frequent challans and selective enforcement. Rather than functioning as a mechanism for road safety, traffic regulation often operates as a form of everyday criminalisation, intensifying livelihood insecurity.

A critical contribution of this study lies in revealing that labour blind spots within climate and electric vehicle policy frameworks. While e-rickshaws contribute to emission reduction and last mile connectivity, the transition to electric mobility has not been accompanied by parallel efforts to ensure labour protection, income

security, or social welfare for drivers. This disjuncture exposes the limitations of techno centric sustainability approaches that prioritize environmental outcomes while overlooking social justice. Without integrating labour considerations, green transitions risk reproducing existing inequalities under the guise of sustainability.

From an urban governance perspective, the findings affirm that informality is not a temporary or marginal condition but a systemic mode of urban organisation. The selective application of legality evident in challans, denial of FIRs and lack of grievance mechanisms positions e-rickshaw drivers in a perpetual state of uncertainty. This reinforces their dependence on informal arrangements, debt, and extended working hours, while limiting their capacity to claim rights or protection as urban citizens.

In conclusion, the study argues that e-rickshaw cannot be meaningfully understood solely through the lenses of transport efficiency or environmental benefit. They must be analysed as a part of a broader political economy of urban labour, where sustainability, informality, and precarity intersect. For e-rickshaw to genuinely function as an inclusive and climate resilient mobility solution, policy frameworks must move beyond vehicle-centric regulation towards worker-centric urban mobility governance. This requires recognizing e-rickshaw drivers as essential urban workers, embedding labour rights within EV and transport policies, and reimagining urban infrastructure as a shared space that prioritizes safety, dignity and economic security.

Without such a reorientation, e-rickshaw driving will continue to remain a livelihood of last resort, one that sustains the city's mobility needs while leaving those that power it economically and socially vulnerable.

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